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THAT Chief Bradley is not only respected but loved by his staff was amply shown the 25th inst., when he was completely in their hands. Space and short time forbid an accounting of that which befell him then—the story thereof will be told next week—so suffice it to say here that it seldom falls to the lot of an active director of a large corps of brainy men to be served as he was served on the day noted by his co-workers on the staff of the Consolidated-Astoria Company.

[OFFICIAL NOTICE.]

The American Gas Institute Response Vote.

HEADQUARTERS, AMERICAN GAS INSTITUTE,
25-29 WEST 39TH STREET,
NEW YORK, August 10, 1908.

To the Members of the American Gas Institute: The Committee of Arrangements, for the meeting to be held in New York next October, is very much gratified by the response to the Committee's request for information. The replies so far received indicate a very large attendance; but there are still 700 members who have failed to fill out and return the postal card sent to them. It will materially assist the Committee of Arrangements if these 700 members will be good enough to fill out the postal card and mail at once.

COMMITTEE OF ARRANGEMENTS, by
W. R. ADDICKS, Chairman.

[OFFICIAL NOTICE.]

Wrinkle Department, American Gas Institute.

To the Members of the American Gas Institute: All members of the Institute are earnestly requested to send in as soon as possible contributions for this year's Wrinkle Department report. The success of the Department depends entirely on the co-operation and assistance of the members.

Mail all contributions to Milan R. Bump, Editor, No. 60 Wall street, New York city.

[OFFICIAL NOTICE.]

Seventeenth Annual Meeting, Michigan Gas Association.

MICHIGAN GAS ASSOCIATION,
OFFICE OF THE SECRETARY,
DETROIT, MICH., Aug. 24, 1908.

To the Members of the Michigan Gas Association: The Seventeenth Annual Meeting of the Michigan Gas Association will be held at Kalamazoo, September 23d, 24th and 25th.

Our programme this year includes an exceptionally interesting paper prepared at the University of Michigan, by Professor Alfred H. White and Messrs. Fred. A. Park and Wm. A. Dunkley, on "The Destructive Distillation of Coal at Low Temperatures;" a paper by Mr. G. W. McKee, of the Peoples Gas Light and Coke Company, Chicago, Ills., on "Industrial Gas;" a combination paper, by Mr. Jayne, of Detroit, on "The Distribution System in Detroit," and by Mr. Wm. Seymour, of the Grand Rapids Gas Light Company, on "The Distribution System in Grand Rapids;" a paper by Mr. E. St. Elmo Lewis, Advertising Manager of the Burroughs Adding Machine Company, Detroit, on "Advertising as it Affects a Public Service Corporation;" a paper by Mr. Clark R. Graves, of Detroit, on "New Business;" a paper by Mr. F. R. Remington, of Battle Creek, on "Labor Saving in a Medium Sized Plant."

The headquarters of the Association will be at the Burdick House, and rates have been arranged as follows: American plan, $3.50, $4 and $4.50. European plan, $2, $2.50 and $3—these prices are all for rooms with bath. Rooms without bath, $2.50, $3.50, American plan; $1.50, $2 and $2.50, European plan. Reservation should be made in advance to secure the best.

The Burdick House was selected on account of its being centrally located. There are, however, two other good hotels: The Rickman and the American House. The Rickman, a new American plan hotel; rooms with bath, $2.50 per day: American House, American plan, $3 per day, with bath. Rooms without bath, $2 and $2.50.

The meetings will be held one block away from the hotel, in the rooms of the Commercial Club, and opportunity will there be given for an appliance display.

Wednesday night (the 23d) there will be an informal dinner at the Burdick House, and entertainment is to be provided in part by Mr. Adams, a representative of the Anchor Packing Company, of Detroit. On Thursday evening (the 24th) there will be a complimentary theater party.

ALONZO P. EWING, Secretary.

LIBRARY OF CONGRESS
AUG 30 1908
SMITHSONIAN DEPOSIT

BRIEFLY TOLD.

Is It a Costly Mistake?—"The German 'Journal of Gas Lighting' for the 8th inst., publishes an extremely ingenious paper, by Herr Kobbert, of Koenigsburg, in which the author seeks to prove, by a well arranged series of figures, that the admission of steam to the bottom of vertical retorts of the coal gas type, making water gas for an hour or so during the latter of the run, is a somewhat costly mistake. His first summary concludes that the periodical joint production of coal and water gas, or, as he designates it, the combining of the dry and wet distillation, as practiced with some vertical retort systems, is, to say the least, uneconomical. By 'dry distillation' he means the coking of coal in retorts without admitting any steam, and by 'wet distillation' the same thing at the beginning and the greater part of the time during which the coking process is going on in the retort, but with the admission of steam for the object of producing water gas during the latter of the time that the charge remains in the retort. His secondary summary concludes with the assertion that making water gas by the commented on method is fully 60 per cent. more costly than when water gas is produced directly according to the regular method.—F. E."

A Successful "Jingle" Contest.—Mr. Horace Beeson, Advertising Manager of the Philadelphia Suburban Gas Company, writing under date of the 26th inst., says: It may be of interest to your readers to know something of the conduct and results of a "Jingle Contest" that we inaugurated July 1st and ran for 1 month. To the gas company that has advertised to some extent and realizes the benefits derived, and to the advertising man who knows full well what good advertising will do, it seems strange there are still many companies trusting to Providence and lack of active competition to sell gas appliances. It has been our policy to educate the public in every way possible to the advantages of gas appliances—many appliances; not being satisfied when nearly every household cooks with gas, but meaning to have nearly every household use gas in several other ways. For this educational reason, more, of course, and to accumulate a stock of "Jingles," we took up the matter of a "Jingle Contest" with our best newspaper advertising medium and secured their cheerful co-operation. We devoted our advertising in this paper entirely to the contest during the month of July, taking rather more space than usual, and stating the conditions each day, with a cut of one or more of the prizes, and one of the best "Jingles" received to date. The City Editor gave frequent mention of the contest in the news columns. The conditions of the contest required that the competitors reside within our territory and limited the Jingles to 12 lines. The prizes included a gas range, water heater, residence arc, reflex light and ten $1 credits on purchases. The City Editor of the *Times* and the writer were to act as judges. This was the only advertising we did except a window display. We exhibited the first four prizes, with neatly lettered cards stating what they were, and arranged, fan shape, 10 crisp new $1 notes, and attached these to the middle of the window against the glass, with pieces of adhesive paper—inside needless to say. Below was a card telling what the notes represented. Then, as "Jingles" came in, we had the best of them typewritten, with names and addresses of the authors, embellished with sundry borders, arranged down the sides of the window. This display attracted much attention and comment. The results from the contest were most gratifying. While, like all advertising, it is difficult to follow results, we feel assured that nothing we ever have done (except when we had to raise the price of gas some years ago) has drawn so much attention to the Gas Company. Everybody learned of it, talked of it, joshed us about it; my friends dubbed me "Jingle" and 334 contributions were sent in for the contest. Therefore, the "General Publicity" was all we could desire. Our announcements stated that advertising value would be judged equally with literary merit. The effect of this was exhaustive reading up of appliances by many people. One contributor sent in 24 "Jingles" incorporating 16 appliances. We had verses on nearly every article we have ever advertised. Therefore, the educational results were gratifying. In addition to the 14 original prizes offered, we added 8 others for those "Jingles" too good to be thrown out. It was a good jolly, and 22 persons got something for nothing. Therefore, our prestige as a "pretty decent corporation" got a boost; besides which, we have "Jingles" to last us to Kingdom Come. After awarding the prizes, we selected 100 of the best "Jingles," had these printed on sheets with an introduction of thanks, etc., and mailed a copy to each of the 100 contributors as an act of courtesy and further advertising. The entire cost of the contest, including advertising and the cost of prizes, was under $125, and we consider that amount very well invested indeed. We inclose under separate cover, a couple of advertisements of the contest, newspaper notices, copy of the 100 "Jingles" we mailed to contributors, and September issue of "Gas-ps."

[Continued from Page 321.]

FOURTH ANNUAL MEETING, IOWA DISTRICT GAS ASSOCIATION.

Held at Omaha, Neb., June 17, 18 and 19, 1908.

Second Day—Afternoon Session.

The President—The next paper will be that by Wm. Taylor, Jr., of Omaha, on

THREE METHODS OF TAR DISPOSAL.

[For the text of the Taylor paper, see Journal, *ante*, p. 54.]

Discussion.

Mr. Bertke—I would like to have Mr. Taylor tell us how he applies the tar in the generator? What method does he use in spreading it; a spray or a pipe?

Mr. Taylor—The tar is forced into the top of the generator through a small nozzle flowing into the steam pipe. It passes into the generator and mixes with the steam, in which way it is spread over the top of the fire or wherever it happens to land. No particular effort is made to spread it as we are running now.

Mr. Bertke—Is there any bad result in the purifiers through using tar in the generator?

Mr. Taylor—We never found any trouble with tar getting beyond the inlet.

Mr. Tenney—Is this tar applied to the generator on the down runs?

Mr. Taylor—Yes; only on down runs, so that the tar is broken up as it goes through the fire into carbon and volatile gas. The gas will go on through and is consumed during the next blow.

Mr. Chubb—We used tar in our generators when I was in Kansas City, and our results agreed with Mr. Taylor's. The principal trouble we had was the clogging up of the hot valves. We had to clean them about once a week. They got so stiff that it was difficult to move them. Our fuel efficiencies were also somewhat better when using tar than without.

Mr. Vincent—Our attention is called in this paper to the fact that we can use water gas tar in a water gas generator with a great deal of economy. It is a matter that has been before the gas fraternity for perhaps two years, and it would be a very interesting thing to bring out why more works have not so used it, if it is worth at least 3 cents a gallon in the generator, because most works are unable to dispose of it at any price.

Mr. Kidder—This discussion doesn't interest me at all. I commenced 10 years or more ago to advertise tar among the farmers as a mite killer, and I dispose of all I can make at 15 cents a gallon from the works, or $5 a barrel if I ship it. I get rid of all I make every year. By July or August we are generally out. One year I shipped in a lot of it.

Mr. Waring—This subject would not interest the smaller works. In Omaha we make from 1,000 to 1,500 gallons a day, and it is necessary to find a large outlet for that, and we are able, as Mr. Taylor has shown, to dispose of our tar in this way, outside of the small amount that we may sell to consumers. We are not forced to go to the tar barons with it.

Mr. Honeywell—We have experimented some with that and did not find it very satisfactory. The first experiments were made at the Madison, Wis., plant, and got all of us up in the air. They had obtained apparently such very good results that it was surprising none of the rest of us had tried it; but when it came to a final showdown it seems their gas was precipitating and shrinking very rapidly, and the gas they were sending out didn't show such good results.

Mr. Waring—In that connection I will say we have been using tar in our generators since 1898, during which time we have only suspended its use for 3 months, when we practically ran out of it.

Mr. Vincent—Just one objection was brought out; that it sticks in the hot valves. A large number of works have tried tar in the generators and stopped using it; but it seems that Omaha can use it with very good results, so it must be something in their method of using it that other works don't seem to have discovered. If Omaha can tell us what that is I am sure we will all be very much interested.

Mr. Tenney—If you will look up the experiments made at Madison, Wis., you will find that they were attempting to use 5 or 6 gallons of tar per 1,000, using coal tar as an enricher.

Mr. Averill—We have only been making water gas tar for a short time, but have sold all our tar locally for painting purposes.

Mr. Crawford—We make both coal and water gas, and I have tried both kinds of tar in the generator. We can use it all right, but we make so little water gas that we have very little water gas tar. We use tar to remove naphthaline. We have a pipe that comes down into the tar pit and catches the tar from the exhauster, and we pump that over the scrubbers to remove the naphthaline. We make water gas direct from the generator into a small relief holder, and then have all the 8-inch line that runs from it to the hydraulic main to our benches. I think the water gas picks up some of the hydrocarbon from the tar in the hydraulic main. We make perhaps 75,000 or 80,000 feet per day of water gas, and by this means we make it a little thinner and cheaper than we could by starting up another bench. We have no trouble in disposing of our tar; have a ready market for it.

Mr. Waring—We would be glad to have any visitors at our plant after the session, and we can show tar being used under our boilers and in our generators. If the weather was not so bad we could show you our tar-coated boulevards. We are negotiating now to coat all the roadways in a large subdivision, and I think that this is going to be the largest outlet for our tar. We get 4 cents a gallon in Omaha in tank wagons at the plant, which we think is very cheap for it. Of course, we have to dispose of it at a low figure in order to introduce it; but after we have had it on the market for some time and advertised it by selling it at that low price, we expect to get more for it. That is water gas tar altogether.

Mr. Vincent—We made a good many experiments in Des Moines in using tar in the generators, under precisely the conditions outlined in this paper. There are two principal objections to its use. The first is that it sticks the hot valves very badly, just as Mr. Chubb said. The second objection is that a good deal of the carbon seems to get over into the carburetter, necessitating more frequent cleaning than before. In discussing this matter with Mr. Waring some time ago, he suggested that either we were putting to much tar in or there was water in it. As a matter of fact there is more water in the tar than Mr. Waring has. He has none and we have from 3 to 4 per cent. The meter that was being used for measuring the tar was taken out, tested and found correct. In regard to using tar under the boilers, the sketch given in this paper shows its use for water tube boilers. If any of the members contemplate using it under horizontal return tubular boilers, they had better take the precaution to turn the burner down so that it shoots to at least an angle of 45°, because if shot straight over the grates and fuel it will certainly melt down the bridge wall. One of the objections to using tar under the boilers is its very high flame temperature, and the tar flame in any form of tar burner impinging on any refactory form of firebrick will melt it down like water. We made some experiments in Des Moines in the use of tar on roads. The only difficulty is that you are absolutely obliged to take advantage of the weather in putting it on, and if you get caught with a very hard storm when you are about half way through, quite often your tar is wasted. Also, we found in our experiments that the ground has to be dry in order to make a good, impervious coating, and the treatment has to be continued. It doesn't do to treat the road 1 year and then let it go, because it won't last indefinitely. It would be better to apply the tar twice a year; but I think if once properly put it condition, one good treatment a year would answer for ordinary light traffic, such as goes on park boulevards and light roads.

Mr. Bertke—Is the surface of the road rolled smooth and hard or is it left in a loose condition?

Mr. Waring—I don't like to take up the time of this Association going into two subjects that I have presented papers on before, but in answer to his question, if we can get the people to round up their road we prefer it, although we can make a fairly good road without it. It is not necessary to do any extraordinary work in preparing the roadway. You can take any dirt, cinder or macadam roadway, without holes or depressions in it to hold water, and it will work satisfactorily; but if water stands in holes in it it will cut through. Where the water strikes it and runs off it is perfectly waterproof and holds down the dust as well. Regarding sticking hot valves, we have them; but we don't have any more trouble than the coal gas man has in stopped standpipes, etc. You can't do anything without some trouble. The ledger at the end of the year shows a profit by using tar in the generators. We only wish we could use all of it in our generators, but we make 0.7 of a gallon and can only use half of it; so we have the other half to dispose of in some way. We could use all of it in the boilers as Mr. Taylor describes, but it is not as profitable to use it there as in the generator. The roadway improvement is the coming field for the outlet of tar and it will bring the market up. If the gas men don't take hold of it the tar people will; in fact, they are even now trying to compete with us in Omaha, and show that their product made of coal tar is better than ours. It is better, because they put it on hot and make it in the nature of an asphalt pavement; but its cost compared with ours is prohibitive.

Mr. Borden—Has that outlet already had any effect upon the coal tar market, or is it reasonable to expect that it soon will have?

Mr. Waring—I know some works in the Iowa district that are getting 3 cents a gallon this year against 2 cents last year; but whether that is the cause or not I don't know. We have this matter in our own hands, and if we take advantage of it we will make good; if not, we will give the business to the tar men.

Mr. Vincent—In the first portion of Mr. Taylor's paper he tells us of his method of separating water from the water gas tar by using two separators in series and circulating from the outlet of the second. We have a similar installation in Des Moines, and it was suggested that a better separation could be obtained by circulating from the outlet of the first separator. I would like to know if Omaha has ever tried that?

Mr. Taylor—In operating two separators we get better results than with one. We get what tar we can from the first separator and get what water off we can. That tar is taken to the second separator with still a small portion of water in it, which I believe would be materially reduced if the tar were put through still a third separator. Most of the time there is only a trace of water in it. In regard to the point brought out by Mr. Vincent as to melting the bridge wall by using tar under the boilers, let me say it is only necessary to put in a loose false bridge wall on the grates. We take old brick and stack them up in loose form. They will melt some on the edges, but they are discarded brick, anyway. As to cleaning the switch valves, we have that trouble the same as anybody else who ever tried water gas tar in the generators; but if you clean them every day you won't find any trouble. The gas maker scrapes that valve daily. It takes anywhere from 10 to 15 minutes. If they are running full 24 hours the handy man does it. The time consumed is really so short that it is not important. The method is simply to loosen the handhole on the bottom of the upper valve, take the long swabber, go up and down each side, and it is ready for another 24 hours. He has scraped 3 that way in 10 minutes. The results obtained in the manufacturing costs well pay for the little effort required to do it successfully. I think the trouble is with the gas makers in burning tar. They don't want to use it. Omaha used tar for practically 9 years without interruption; the gas makers never knew that they could get along without it; they thought that was an essential part of gas manufacture. When we stopped the use of it for a short time and they found that they could get along without it, when we started in again they had all manner of excuses. We told them they had to use it and now they do.

Upon motion, a vote of thanks was extended to Mr. Taylor.

Mr. C. N. Chubb, of Sioux Falls, then read his paper on

BOILERS AND BOILER COMPOUNDS.

[For the text of the Chubb paper, see JOURNAL, *ante*, p 137.]

Discussion.

Mr, Vincent—I note in the three analyses of water "B" and "C" are not totaled. "B" totals 18.2 grains per gallon, and "C" 17.6 grains. The reason I add these is because the total scale-forming material in any water in grains per gallon is generally taken as an index of the quality of the water and of its availability for boiler use. This may sometimes not be the case. For instance, in this water "C," one of the largest percentages of scale-forming material is not at all detrimental in the boiler. We have had some very interesting experiences in Des Moines. About 3 years ago I completed the construction of a feed water heater which had been started some years previously, and put it into use. This heater consisted of two closed tanks and an open tank in series. The first tank was so arranged that the water was sprayed through the exhaust steam and then flowed by gravity through the second tank, which contained a corncob filter for the removal of grease. The water then flowed to the third tank, which was open and contained a float which regulated the supply. The water which we used at that time analyzed as follows:

Components.	Per Cent.	Components.	Per Cent.
Soda and chloride.....	0.57	Calcium carbonate ...	4.32
Sodium carbonate.....	3.85	Silica.	1.30
Magnesium carbonate.	7.30	Total solids. 28.01	
Iron oxide.....	0.71		
Calcium sulphate.....	9.96		100.01

At this time there was being used in the boiler a proprietary compound, which had been fed into the boilers through the injectors. After the installation of the feed water heater, the compound was dropped into the open tank and fed in with the water. It was observed that a smaller quantity of compound was required to keep the boilers in good condition after the installation of the feed water heater. And it developed later that this was brought about by the deposit of fairly large quantities of hard scale in the corncob filter. This filter had been so constructed that it could be readily cleaned; but the first tank had to be altered and removal plates arranged for cleaning. The temperature of the outlet of the feed water heater varied from about 200° to 210° F., and the hard scale was evidently due to the partial deposit of the calcium sulphate and the magnesium carbonate by heating alone. This treatment gave great satisfaction and kept the boilers practically free from scale and without the slightest trace of corrosion, but had the disadvantage of being slightly expensive. It was decided to experiment with other treatments. After consultation with several chemists and engineers it was decided to try plain soda ash. The quantity of soda ash was figured out theoretically from the water analysis and fed in the same way by dropping into the open tank of the feed water heater. The results obtained were anything but satisfactory. If enough ash were used to prevent the scale the boilers foamed badly, and any decrease in the quantity, to a point approaching the theoretical amount, caused large deposits of hard scale in the boilers. The experiment was continued for about 6 months and then given up and the use of the proprietary compound resumed. The experiment with soda ash not only brought about the expenditure of a great deal of extra labor on the boilers and an increase in the fuel bill, but also was the direct cause of some good sized repair bills on all three units. I was very much disappointed in the failure of the experiment and decided to find out wherein the particular virtue in the preprietary compound lay, and had it analyzed. The analysis in round numbers was as follows:

Constituents.	Per Cent.
Sodium carbonate	35
Caustic soda	10
Organic matter	20
Moisture	35
	100

The organic matter was gambier or bark extract, or some similar compound. I determined to make up some compound similar to this and try it, and endeavoring to secure a good price on gambier or bark extract, I called at a local tannery and found they were using gambier alone as a boiler compound and were using city water from the same main as that which supplied the gas works. Their unit was a small one but was operated continuously. I subsequently examined this boiler after it had been running nearly 6 months without cleaning and it came off without any scale. I thought I observed, however, some traces of pitting corrosion on the flues. The boiler was, of course, blown off at regular intervals. The home-made compound has been exceedingly satisfactory. The method of preparing it is as follows:

In an ordinary 52-gallon barrel half filled with water is placed 60 pounds of gambier. The mixture is then boiled with steam until the gambier is completely dissolved. This liquid is then divided into four parts and placed in separate barrels. To each barrel is then added 15 pounds of caustic soda and 50 pounds of soda ash and filled up with water. The liquid is placed in the feed water heater and fed into the boiler with the hot boiler feed water.

You will note that this works out to 1 pound of soda ash, 0.3 pound caustic soda, and 0.3 pound gambier to each gallon of liquid. The liquid is fed into the open tank of the feed water heater in liquid form. The results have been very satisfactory. The amount used is varied with the condition of the water. It has been found by analysis that the scale-forming matter increases during low water period and decreases during high water. This variation will be as much as 50 per cent. Each boiler is taken off every 3 weeks and washed out. The water supply for the boilers is drawn, as stated above, from the city mains. The city water supply of Des Moines is pumped from timber galleries constructed under the bed of the Raccoon river, a tributary of the Des Moines. This river is underlaid by a bed of natural filtering sand of varying thickness, and the galleries are constructed through this sand with open bottom. The Des Moines river is also underlaid with these coarse filtering sands, which extend back under the banks for considerable distances. In attempting to secure a water supply for the use at the gas works a well was sunk in the works' yard, to, and into, a sand bed, and a plentiful supply of apparently very good water was secured. Upon analysis, however, it showed an enormous amount of scale-forming material, and was corrosive. In fact, it compared very favorably with coal mine water or alkaline wells. It could not even be used in our water gas condensers. It was thought this water owed its large amount of mineral matter to the fact that it flowed considerable distances through the sands, and it was decided to construct a natural filter of our own on the bank of the river. By the use of sheeting a hole about 13 feet in diameter was started close under the river bank and extended to a depth of about 6 feet into the filter sand. It is proposed eventually to wall this in and put a tight cover over it. This gave a very good supply of water, but it also carried a very large quantity of scale-forming material. This is rather curious, as it is drawn under similar conditions to that of the city water company. To illustrate the differences in waters, I give below the analysis of city water and the analysis of the filter water on the river bank, and also an analysis from the well in the works' yard. The first two were taken at about the same time and the third about 6 months previous. It illustrates very fortunately the fallacy of jumping at conclusions in regard to waters when you are changing your source of supply:

	Grains per U. S. Gallon.— City.	Filter.	Well.
Silica	0.92 per cent.	1.19 per cent.	3.73 per cent.
Iron oxide and alumina	0.11 "	0.16 "	0.12 "
Calcium sulphate	4.63 "	24.70 "	44.94 "
Magnesium sulphate	.... "	.... "	11.79 "
Sodium chloride	0.44 "	2.20 "	14.74 "
Potassium chloride	.... "	.... "	0.87 "
Magnesium chloride	.... "	.... "	15.66 "
Calcium carbonate	8.51 "	7.98 "	.... "
Magnesium carbonate	5.39 "	9.94 "	.... "
Sodium sulphate	1.00 "	3.70 "	.. "
Organic matter	1.38 "	3.01 "	11.72 "
Suspended mineral	.... "	.... "	4.56 "
Suspended organic	.... "	.... "	0.16 "
	22.38 "	52.88 "	108.29 "

Discussion.

Mr. Taylor—I had occasion not long ago to investigate boiler compounds for the use of the Omaha plant. An analysis of one compound offered to us showed, in per cents., moisture, 12, sodium carbonate, 64, organic matter, 12. The price quoted on the compound was 8 cents f.o.b. Chicago. We were able to buy the sodium carbonate at 1¼ cents, and the tannate of soda, which we use in connection with it, at 3¼ cents, making the cost about 5½ cents. We place the Na_2CO_3 and the tannate of soda in the feed water in one of the condensers, so that the water is thoroughly saturated before it reaches the open feed water heater. As the temperature of the water in the heater is raised to from 200° to 210°, a considerable quantity of scale-forming material is dropped here. So much, in fact, that we have to clean the heater thoroughly about every 6 weeks, while without the purifying material we can run from 6 to 8 months. In using Na_2CO_3 there is danger that the feed pipe from the pump will become choked in the boiler supply pipe and to a decreasing extent from that point back to the pump. This point was called to our attention soon after we had begun to use Na_2CO_3, and an examination of the piping showed that, right at the boiler, the 1¼-inch pipe had become choked, so that there was not more than a ¼-inch opening. The piping was all cleaned out, and since that time we have been feeding about a quart of kerosene oil to the feed water piping every 24 hours. This is fed to the suction pump by an ordinary engine lubricator, the water being displaced by city water pressure, the idea being that the kerosene would cut the scale. Although the piping has not been examined the action of the feed pumps would indicate that the desired result had been attained. I believe that boilers in this vicinity should be equipped with live steam, feed-water heaters, in addition to the open heater. A great many of the scale-forming materials are dropped out and deposited at a temperature between 200° and 212° and caught in the open heater. While calcium carbonate and calcium sulphate are deposited at a temperature of about 300° F., as this corresponds to only 55° gauge pressure, it will be seen that the live steam heater will catch most of it, provided it is of ample size and properly attended to, and the boiler will be relieved of a burden that it was not intended to carry. I wish to corroborate what Mr. Chubb has said in regard to using caustic soda to soften boiler scale. We have been using it in 3 boilers that were badly scaled, with a scale consisting principally of $CaSO_4$, which is very hard and tenacious. After the boiler has been let down we open the manholes and put in about 50 pounds of caustic soda, then close the boiler and fire it at about 5 pounds pressure for from 24 to 48 hours. The scale is then found very soft, but it hardens again on ex-

posure to the air, so that the boiler must be cleaned quickly. This operation must be repeated for several boiler cleanings before the boiler will become perfectly clean. The question as to the amount of loss of efficiency due to boiler scale is disputed, but it will vary according to the nature of the scale. A hard scale will materially reduce efficiency, but a soft, porous one, where the water is able to come into contact with the iron through the scale, will not cause a material loss. Unfortunately the scale formed in this region is of the hard kind.

Mr. Waring—This paper is a little over my head at the present time. I thought I knew something about chemistry, but I can't digest the paper on so short notice. Mr. Chubb makes reference to the hammer or knocker tube cleaner. We had some very sad experience with that type of cleaner, and had to abandon the use of it on account of swelling the tubes. As to shutting down the boiler and putting in oil, that is another thing that I have known to cause a serious accident, a lighted candle for some reason or other being stuck in the manhole by the man working on it, who was very badly burned. While this is a little off the subject of boiler compounds, at the same time the care of boilers comes in with that. My attention was called to a very serious accident which occurred by having several boilers connected with the same blow-off. Many of us have this connection, and I think we ought to seriously consider those things as they are brought to our attention.

Mr. Vincent—In connection with letting down a boiler, we have one in Des Moines that is only in use 3 months in the year, and the question came up as to the best way of leaving it when it was idle. We took it up with the Hartford people, and their instruction was to have the boiler thoroughly dry inside and leave both manholes out.

Mr. Tenney—Some months ago we received a letter from some boiler compound people stating that their product placed in the water did not affect the boiler, but had an affinity for the heated metal under steam pressure, and would not only adhere to the flue, but would throw off and cure the scale, so it would be thrown down where it could be removed, and would also prevent, so long as it stayed there, adhesion of the scale. What I would like to know is whether the tendency of a thing of that kind is to hurt the boiler. It looked to me a very practical thing, provided it would do the work. We have put it in several very dirty boilers. One I found hadn't been cleaned for 8 months, and when we opened it up we couldn't see the flues at all. We worked on it 2 months and finally put in a new set of flues. We are not laying it to the boiler compound, but I would like to know from any gentlemen who can give us light on that whether that is a practical method of preventing and removing scale.

Mr. Waring—Regarding the use of boiler compounds, I think we ought, as scientific men, take the same position towards those that we don t know anything about as the physician takes in recommending patent medicines that he doesn't know anything about. I would as soon use peruna in my boiler as some of the boiler compounds that come around to me, unless I had them analyzed. It would do just as much good.

The President—I would suggest that one of the best methods of taking care of boilers is to carry steam boiler insurance, because the inspection you get is well worth the cost, not only in preventing accidents, but in saving the boilers. While I don't think any reliable insurance company will recommend a compound, I believe that, if you send them samples for analysis, they will tell you whether or not it will be efficient in your boilers, and that is what we all want to know. Steam boilers deteriorate very rapidly if not properly taken care of, and as a great many gas works only have one boiler, on which their output and the efficiency of the plant are dependent, they should, therefore, I believe, take every precaution to preserve its operation.

Mr. Grey—Has anyone in this district installed any plant for softening the water before it enters the boilers? I believe the railroad companies do this a great deal, but I don't know whether the cost of the installation would prevent its being adopted.

The President—I presume the cost of installation is rather prohibitory in the average gas works, but I presume very few are in use by the gas companies.

Mr. Chubb—I know of one installation where they run two 60-horse power boilers. Their installation cost them $2,000 and it is doing very satisfactory work. I saw their boilers not long ago; they hadn't been opened up for 2 months and were absolutely clean. I don't think you can take the total number of grains of impurity in the water and say that it isn't any good for boiler purposes. All the impurities in that water may not be detrimental; that is, they can be removed very easily. This first water "A" has a total of 48, I think, and it is being used successfully. I was glad to have somebody bring up the subject of kerosene in the boiler. I have never had any experience with it, but have run up against the same trouble spoken of by having the feed water pipes stop up. Mr. Vincent said he used soda ash according to the formulas to fix his water and didn't get any result. I wonder if he knew what soda ash he was using. It might be doing its work, but there might be something else in the water that was causing the trouble after he had thrown out his minerals with the soda ash. Mr. Taylor said that the spongy scale was not as bad as the hard scale, whereas I think it is worse. I never used a pound of boiler compound myself. We have all our boilers inspected by an insurance company and have never had a bad report on scale. The compound Mr. Tenney spoke of I have seen used with good results; but there must be something in it that would attach itself to the iron. There must be some chemical action there, and it seems to me that some time or other it is going to be a detriment to the boiler.

Upon motion a vote of thanks was tendered Mr. Chubb for his paper and the convention thereupon adjourned to 10 A.M., Friday.

[To be Continued]

The Improved Turner-Fricke Gas Engine.

The type of gas engine illustrated herewith is the result of over 10 years of experience with installations in various kinds of continuous and intermittent service. These engines are built in sizes ranging from 25 to 325-horse power by the Turner-Fricke Mfg. Company, of Sharon and Pittsburgh, Pa. The design upon which they are built, as stated by the Company, is simply the harnessing of old successful principles in a good substantial machine, made in consideration of the fact that every machine in active service needs occasional adjustment and repairs. These, however, are minimized by extra large wearing surfaces on all moving parts, and by having all stationary parts extra heavy and rigidly constructed. The Turner-Fricke gas engine, of which a perspective view is given in Fig. 1, is of the 4-cycle,

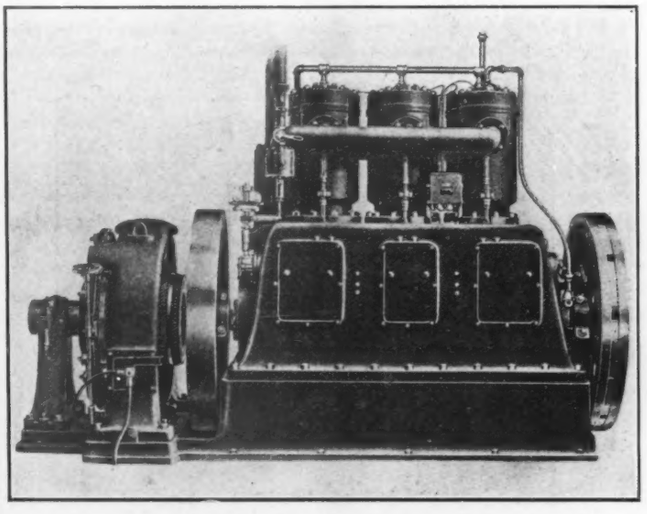


Fig. 1.—A 150-Horse Power Turner-Fricke Gas Engine Directly Connected to a 90-Kw. Generator.

multiple cylinder, vertical, inclosed type. Large covered manholes—both front and rear—are provided so that all moving parts are easily accessible for inspection or adjustment, and, in addition to a splash system, the main and crank journals are lubricated by a forced feed system.

Occasionally an engine is wrecked or put out of service temporarily by the breaking of a crank shaft from no apparent cause. In almost every case this is due to the imperfect alignment of the main bearings. This springs the shaft, gradually crystallizes the steel and ultimately results in a fracture and the accompanying losses. In the engine here illustrated the crank shaft bearing pillow blocks are cast as a part of the base, which makes it impossible to disturb the lateral alignment of the crank shaft. To facilitate accurate machining, and thus establish the correct and permanent line for the shaft, the engine base has been cast separately from the crank case. Being a single acting engine, the wear on the bearings is on the lower half. The shaft is in alignment when up against the bearing caps, which are bolted, without shims, to the top of the pillow blocks, and thus fixed

in their correct location. Adjustment for wear is easily made by means of wedge bolts. No outside reference marks or loose gauges are required for aligning the shaft; danger of springing the shaft is entirely eliminated, and compression in the cylinders is not decreased by the shaft gradually wearing to a lower center.

Valve trouble is one of the chief grievances of gas engine operators. This may arise from various causes, as follows: Inadequate cooling, poor materials, faulty actuating mechanism, or improper location. It is essential that the seat be sufficiently and evenly cooled to prevent burning or warping. Locating a valve in a removable cage does not give the benefit of water jacketing on account of the distance between the valve seat and the water, which this arrangement necessitates.

It has been repeatedly proved that metal-to metal is a good conductor of heat only when the joint is fused or a tightly driven fit. Using poor material causes the seat to pit and cut, and makes it impossible to maintain a tight valve even with frequent regrinding. Inferior material is also responsible for valves breaking off of the stems and getting into the clearance space between the piston and cylinder head, with disastrous results. Too often the actuating mechanism is complicated, or is not adjustable, or does not act in a straight line, thus tipping the valve on its seat and wearing the guide out of true. Generally this mechanism is located on, or so as to interfere with, some parts that should be removed for occasional inspection or adjustment.

Valves are best located on a vertical axis in a water jacket completely surrounding the seat. They should be so arranged as to be always in alignment with the actuating mechanism, which should move in coincidence with the axis of the valve. A wise precaution is to have the valve and clearance space so designed that there shall be no pockets to retard rapid combustion and complete scavenging, and still so as to prevent a valve from getting into the cylinder, should one happen to break from its stem. That these conditions give ideal results has been demonstrated in the Turner-Fricke engine, in which exhaust valves have been used in almost continuous service for more than a year without regrinding and yet showing only the slightest wear.

The arrangement of the valves in this engine is shown very clearly in Fig. 2—inlet in front and exhaust in the rear, each controlled independently by separate cam shafts. In this illustration will be noticed a small ground joint cover directly over each valve. This obviates the necessity of removing a head or breaking water connections to inspect or regrind valves. It will also be be noticed that the heads carry no moving parts, and hence may be removed readily for inspecting cylinders and pistons without interfering with any of the mechanism. A section through a valve, with its water jacket, is shown in Fig. 3.

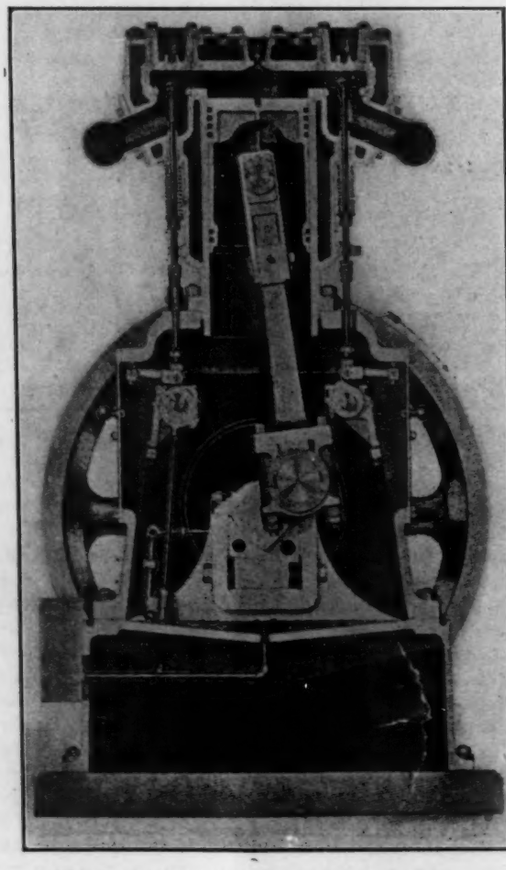


Fig 2.—Section Through a Turner-Fricke Gas Engine.

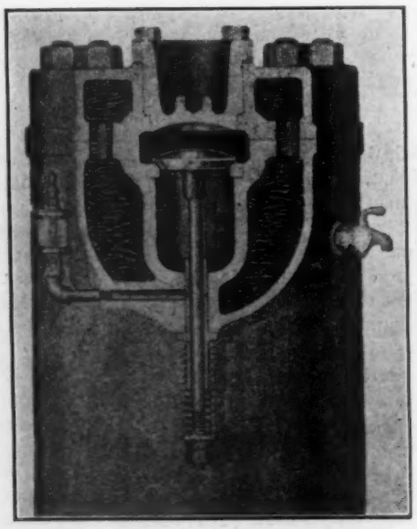


Fig. 3.—Section Through a Valve Showing the Water Jacket.

The governor is driven by means of a pair of bevel gears, from the inlet cam shaft on which there is little torque or wear on account of the ease with which the inlet valves are operated, and therefore gives close and steady regulation. It is of the throttling fly-ball type, with heavy weights and stiff springs. The gas and air mixing valve, Fig. 4,

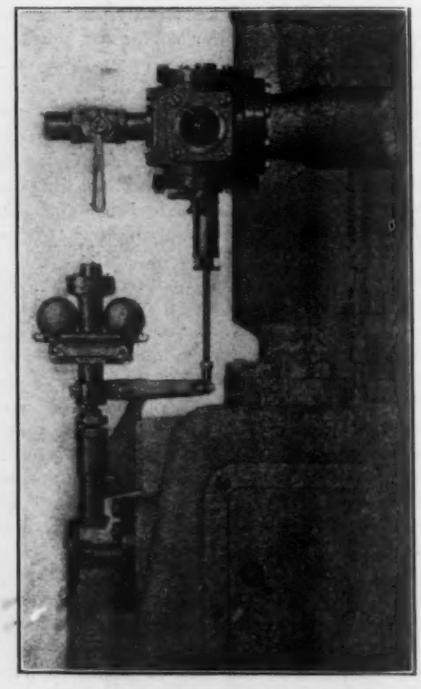


Fig. 4.—The Governor and Mixing Valve.

is of the balanced piston type, with ports so arranged that the proper proportions of gas and air are automatically maintained under all loads. The ports are so located that a thorough mixture is assured. The proportion of air and gas may be regulated by means of a hand lever while the engine is running.

Automobile builders have been responsible for many of the improve-

ments in modern gas engines, although the developments have been of smaller size than on stationary engines. Among other things, they have impressed the advantages of a good lubricating system, which increases the mechanical efficiency and greatly prolongs the life of the wearing parts. Supplementary to a splash system, the Turner-Fricke engine has a forced feed system which is shown in Figs. 2 and 5. Oil is pumped into the main bearings, Fig. 6, thence

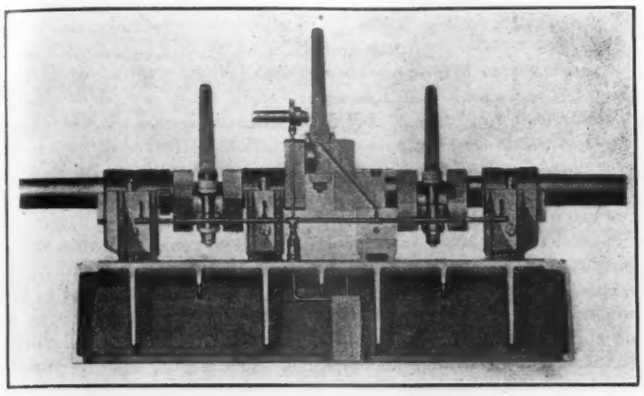


Fig. 5.—Section Showing the Forced Feed Lubricating System.

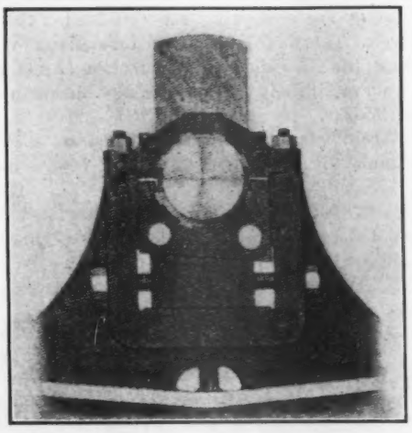


Fig. 6 —Main Bearing of a Turner-Fricke Gas Engine.

through oil holes in the crank shaft to the crank pins. This oil, which also supplies the splash system, is drained through filters and is continually kept in circulation, flooding the bearings. The oil pump, operated from the exhaust cam shaft, together with the oil piping, is inclosed in the crank case, making it easy to keep the engine clean and giving it a neat appearance. Where only the splash system is used, there is a tendency to prevent oil from reaching the crank pin journals, due to centrifugal force caused by the high rotating speed of the cranks.

A notable feature of the Turner-Fricke engine is the compressed air starting device, Fig. 7. It is actuated by a cam on one end of the inlet cam shaft, and is automatically thrown into service by turning on the air supply, dropping out of use when the air is shut off. The air pressure takes the place of springs, and there are no small valves or mechanism to get out of order. A simple jack on the exhaust valve push rod enables the valve to be kept open to prevent compression in one or more cylinders while starting the engine. A special device is provided on the inlet valve to keep it closed while starting with compressed air. These contrivances also enable the operator to cut out any cylinder while the engine is running.

Complete satisfaction has been derived from the use in this engine of jump spark ignition. Besides presenting mechanical and electrical advantages which should not be overlooked, there are no springs to stick, no push rods or lever arms to adjust and oil, and no transmission mechanism to keep in repair. A small adjustable timing device on one end of the exhaust cam shaft regulates the time of ignition of the explosive mixture. The igniter plug enters the center of the compression space through the cylinder head, and is well water jacketed, thus assuring long service and preventing premature explosions. There are no pockets in the clearance space to cause slow combustion or to retard scavenging, and no projections to become overheated and

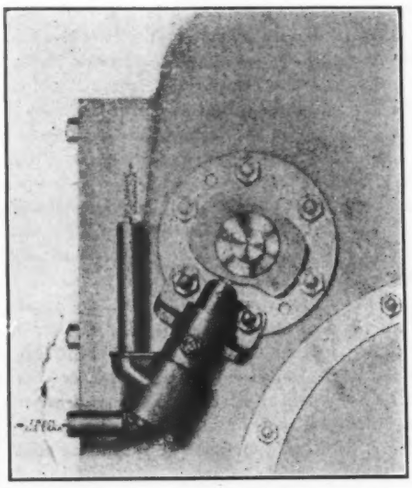


Fig. 7.—The Compressed Air Starting Device.

cause premature explosions or "back shots." The location of inlet and exhaust valves on opposite sides of the cylinder permits the fresh incoming charge to sweep out almost all of the spent gases and leave a rich, quick igniting mixture for every impulse.

The finished parts of the engine are made in accurate jigs and templates by machines especially adapted to this particular grade of work. This assures interchangeability of like pieces and minimizes the number of patterns and castings necessary to be carried in stock for construction purposes and for emergency repair cases. All nuts, bolts, and, in fact, all parts that might otherwise possibly work loose, are securely locked and pinned, thus safeguarding against mishaps.

By means of the large covered manholes in the crank case, all of the moving parts—including the upper end of the connecting rod—are easily accessible for inspection and repairs. Lack of consideration for the operating engineer, making it irksome for him to care properly for his engines, generally results in costly repairs and loss of time, which would have been prevented could he have made regular inspections conveniently.

With the present competition among engine builders, it is essential that a gas engine which would maintain a hold in the trade should be properly designed and constructed so as to run smoothly, quietly and continually, capable of handling varying loads steadily and efficiently, and with a minimum cost for maintenance and repairs. Reliability, which has been satisfactorily attained in the high grade gas engine, is a very important factor, in view of the loss which an unexpected shut-down entails.

The Lighting of Churches.

In discussing a paper entitled "Church Lighting," prepared by Mr. Emile G. Perrott for the Philadelphia section of the Illuminating Engineering Society, Mr. Carl Hering remarked that it is necessary to have shadows in illuminating the face of a person who is addressing an audience in order that the expression of his face may be clearly seen. Hence diffused illumination in front of a speaker's face, or illumination from a number of scattered lamps, would be ineffective, because neither of them throws shadows; in such illumination the face would be likely to be equally illuminated all over and would, therefore, look flat and the expression would be lost. The same would be true for a strong light from a reflector directly in front of the speaker, as is frequently used in theater lighting. The other extreme is a single strong beam of light from one side which gives too great a contrast between lights and shadows in the face, producing a sort of Rembrandt effect. It seems, therefore, that to illuminate a face most effectively, one should study the practice of photographers in making portraits, as the photographer has studied the question of bringing out the features of the face more carefully than anyone else. He uses a certain amount of diffused light coming from a limited direction, together with some small white reflecting surfaces to accentuate the light from one particular direction above and to one side of the face, so as to produce shadows, but without having any sharp contrasts between lights and shadows.

Indirect illumination from concealed lamps is recognized by all as being beautiful and effective, but it is generally supposed to be expensive on account of the loss of light by absorption. While it is true that there is a great loss of light, another factor enters to overbalance the loss in many cases. The better the details can be seen the more effective is the illumination. When there is a bright, naked lamp in front of the eye the pupils contract and, therefore, the eye takes in less of the light and the things that are illuminated are not seen as clearly as may be done with less light and a wide open pupil. Hence the fact that there is less light with indirect illumination does not necessarily mean that we see less, but, on the contrary, we may really see better. In many cases one could see more clearly with the subdued diffused light from indirect illumination than with bare lamps glaring in the eyes, on account of the action of the pupils. Therefore, indirect illumination is not only more aesthetic, but even enables one to see better. In other words, although the actual illumination measured in foot-candles would be far less, the things that are seen with wide open pupils are made even more clear than with fewer lamps shining directly into the eyes and thereby contracting the pupils. Mr. Hering expressed the opinion that in the future, although we may not live to see it, illumination will be obtained from large areas of low brilliancy, as from large phosphorescent or fluorescent surfaces instead of from small filaments or arcs of intense brilliancy, according to the practice of to-day. The use of concealed lamps is a step in this direction, though at the sacrifice of much light. When we learn how to produce such low brilliancy surfaces directly, instead of indirectly by reflection from intense lamps, it will probably be found to be a much cheaper form of illumination, besides being more effective in most cases.

Prof. A. J. Rowland said that he had never seen an evangelical church which he considered properly lighted. Usually an arch at the platform is put too far behind the speaker to be of any value for use with concealed lamps, or it is nearly directly above the speaker's head where the lamps cast shadows. Sometimes the lamp is under the nose of the speaker, sending a glare into his face. He stated that in a certain room the difficult problem of lighting the face of the speaker properly was solved in the following manner: The ceiling of the room was about 15 feet high, and there were two groups of lamps placed somewhat at the side and near the ceiling. They were arranged in a line with the front edge of the platform, so that the lamps were just in front of the speaker. Such an equipment should light the speaker very well and illuminate anything that he wanted to read.

In the lighting of churches the expense is an important factor for perhaps 80 per cent. of the installations. Anything in the way of art glass upon or around the fixtures cuts off the light and increases the expense. Thus artistic and churchly effects are apt to make the lighting expensive. Good and beautiful church lighting is desirable, but it is well to beware of such things as stained glass, which decorators like to use, because good lighting is hard to procure when it is used.

Another thing of importance is the brilliance of light in churches. In some churches where many lamps are provided never more than half of them are used. Sometimes also the controlling apparatus is placed in such an awkward manner that it is impossible to control the lamps without startling the congregation and attracting too much attention.

Mr. Perrot agreed with what Mr. Hering had said concerning a lower degree of illumination from church lighting, by the use of a system which does away with fixtures that allow the naked lamps to be exposed to the eye. Parctical experience shows that with the strain of naked lamps on the eyes in certain positions it is impossible to see the center of the altar, because the lamps are on top of the pews and just at the level of the eye, and thus interfere with a clear view of the altar. It is impossible to see the other end of the church through these naked lamps, while if those same lamps were arranged on each side of the church so as to make general illumination, although certain parts would not be lighted nearly as brightly as they are now, the effect on the congregation would be nearly perfect. A bright light contracts the pupil of the eye, while if the light is dimmer, the pupil will expand and put the owner more at his ease. People should not be compelled to look through lamps in order to see what is taking place beyond them. As it is necessary to have a bright light on the speaker there is no objection to suspending lamps from the ceiling or putting them on standards, or arranging them in any other way that will throw light on the speaker, provided the desired result is obtained and the naked lamps do not shine in the eyes of the congregation. Art will aid in enriching the bald construction of the fixture, or whatever it happens to be, and will lend its influence to enrich the dark side of the fixture. Whether the solution of the problem is to have a higher foot-candle of illumination or to project light on the speaker will have to be determined by experience.

The Morison Suspension Furnaces for Internal Furnace Boilers.

Designers and builders of boilers, as well as engineers generally, will be interested in the seventh edition of the book entitled "Morison Suspension Furnaces for Internal Furnace Boilers," just issued by The Continental Iron Works, Brooklyn, N. Y.

The book deals with the use of the Morison Suspension Furnaces, of which The Continental Iron Works is the sole manufacturer in the United States, in connection with land boilers only, in contradistinction to the application of the same type of furnace for marine purposes. It is a finely compiled and printed volume of nearly 70 pages, bound in a serviceable cover.

It carries a fund of valuable data, with numerous illustrations, including a number of important installations of internal furnace boilers using the Morison Suspension Furnace, together with details of design and construction, tables of pressure and thickness, and rules for calculating same.

The designs shown are for land boilers ranging from 50-horse power to 300-horse power, and are intended to meet general requirements, it being explained that where boilers are designed to work under other than normal conditions, the designs are offered by way of suggestion only. A form of specification for internal furnace tubular boilers, which accompanies the designs, should prove an important aid.

The closing part of the book carries a partial list of installations of these boilers fitted with Morison suspension furnaces, many of which are repeat orders, demonstrating the satisfaction this type of steam generator gives. This is followed by illustrations and full information regarding the Morison patent furnace fronts and doors for economical and rapid firing, which are also made only by The Continental Iron Works.

Engineers, architects and boiler manufacturers will find this book of great assistance to them in designing and laying out steam power plants.

The book is printed by Mr. H. Edwards Rowland, New York city, and a feature of the text is a clever adaptation of photographs, showing various applications of the Morison furnace.

Bureau of Information, The American Gas Institute.

BUREAU OF INFORMATION,
THE AMERICAN GAS INSTITUTE,
HEADQUARTERS, 716 LOCUST STREET, ST. LOUIS, MO.
W. A. BAEHR, Chairman.

ANSWERS TO QUESTIONS 17, 22 AND 27.

Question No. XVII.—"What is the best plan to use to keep water in tank and cup of 400,000 cubic feet holder from freezing, in locality where the mercury drops 30° below zero?"

ANSWER BY THE BUREAU OF INFORMATION.

The Bureau wishes to make only a few general remarks in regard to this question, and for details calls attention to the answer-at-large given by Mr. H. Russell, Supt., Rochester (N. Y.) Railway and Light Company.

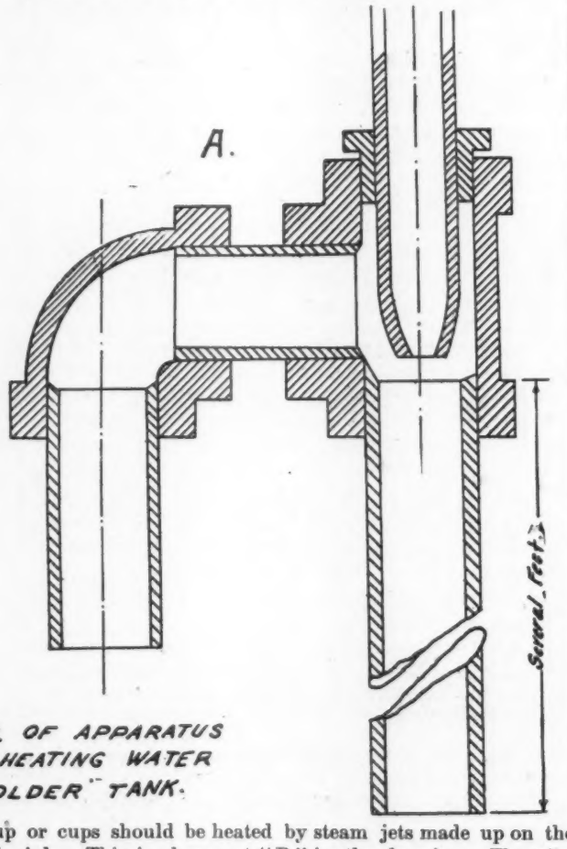
If the above question means that it is only occasionally that the temperature drops as low as 30° below zero, then it would be sufficient to provide a liberal system of piping to carry live steam to the holder tank, to the cups and to the bottom of the tank; this piping being provided with ejectors of the Koerting type, so that the steam would not only give up its heat to the water, but, by pointing the ejection pipes all in one direction, would also keep the water in circulation. The air should be excluded from the surface of the water by means of rubber flaps.

If the question means that the temperature drops to 30° below zero, and remains at this temperature for considerable periods of time, it might prove advisable to inclose the holder in a building constructed of a material having air spaces, such as, for instance, hollow concrete blocks. The ejection pipes at the bottom of the holder tank would be directed toward the crown support, as cases have been known of ice forming around the crown support.

ANSWERS-AT-LARGE.

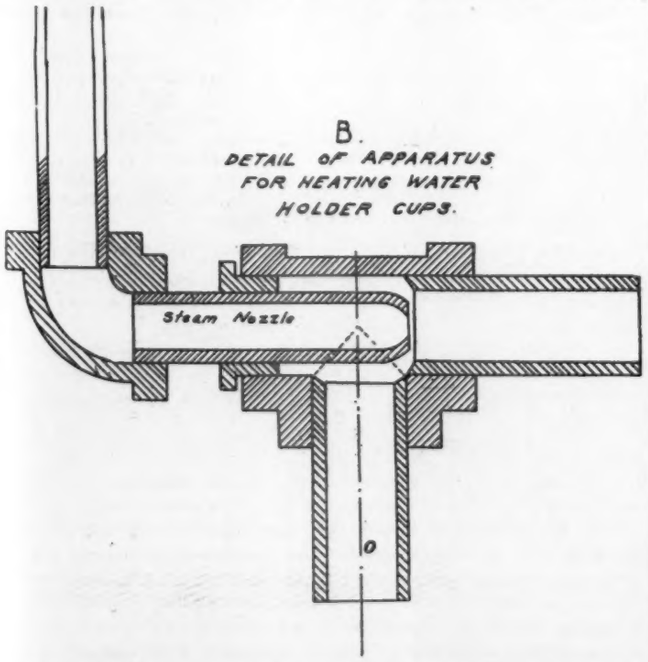
By Mr. H. Russell, Rochester, N. Y.—Such a holder should be heated with live steam at a pressure of not less than 50 pounds. Where

the steam pressure is subject to fluctuations a regulating valve on the main line to holders is advisable. Main line should be not less than 2 inches and carefully insulated. The steam jets in the tank should be on the injector principle, so installed that they suck the water from near the surface and discharge at a point below the surface equal to about two-thirds of the height of the tank. The discharge ends should preferably be turned in one direction as a further aid to circulation. This arrangement, marked "A," is shown on the drawing.



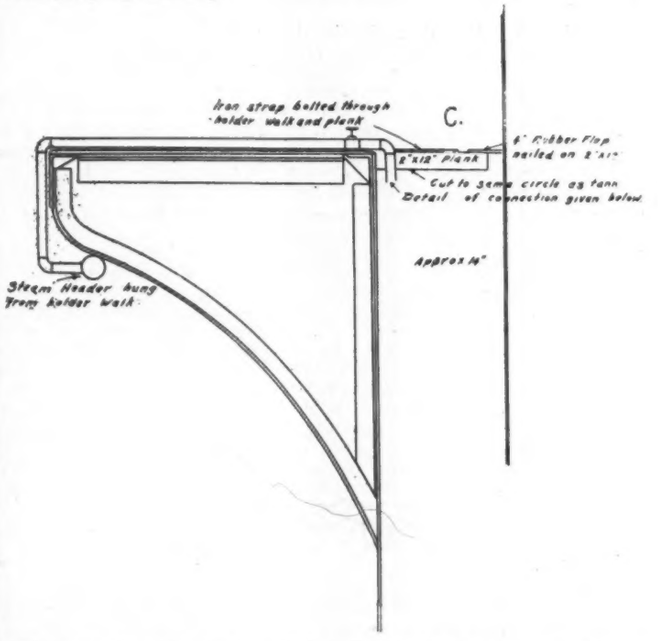
DETAIL OF APPARATUS FOR HEATING WATER HOLDER TANK.

The cup or cups should be heated by steam jets made up on the same principle. This is shown at "B" in the drawing. The pipe

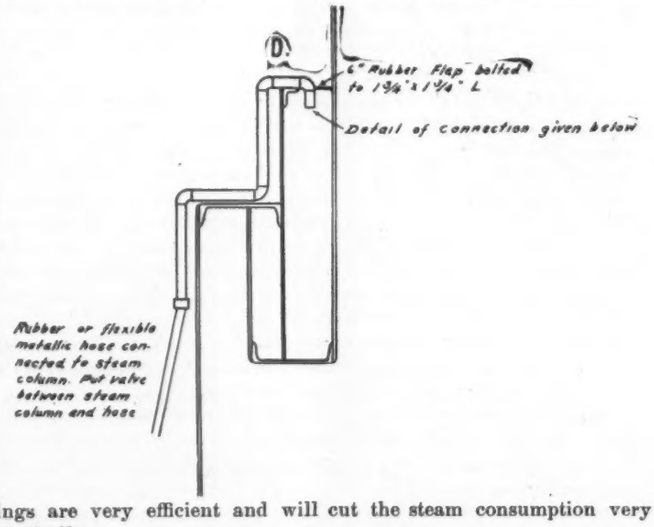


DETAIL OF APPARATUS FOR HEATING WATER HOLDER CUPS.

marked *O* should be near enough to the surface so that, in the event of back siphoning, the cup would not be unsealed. Each jet to the cup or cups should be from a separate riser with shut-off valves at bottom, and each riser should be arranged with a small bleeder opening to the tank, so that all water will drain from the riser. Hose connections to the cup should preferably be flexible metallic, and hose provided with flexible couplings at points of connection. The water space between the tank and outer lift should be covered with a weather board and rubber or canvas rubbing strip, as shown at "C" in the accompanying drawing.


Iron strap bolted through holder walk and plank
C.
6" Rubber Flap nailed on 2"x12" Plank
Cut to same circle as tank
Detail of connection given below
Approx 14"
Steam Header hung from holder walk

The expoeds watersurface of the cups should be covered with canvas or rubber flaps, as shown at "D" in the drawing. These cover-


D.
6" Rubber Flap bolted to 1¾"x1¾"x¼" L
Detail of connection given below
Rubber or flexible metallic hose connected to steam column. Put valve between steam column and hose

ings are very efficient and will cut the steam consumption very markedly.

By Mr. W. R. Putnam, Red Wing, Minn.—While we are using a 150,000-foot cubic holder instead of a 400,000 foot cubic holder, the same plan of piping should apply to the larger as to the one we are using. We carry a ¾-inch pipe part way around the walk on top of the tank, and turn steam directly into the water at from one or all three openings, according to the weather conditions. These openings are arranged so as to keep the circulation of water around the tank. We only use one such opening in our cup, the connection being mad with flexible metallic tubing. We find this one opening ample to keep up a circulation of water around the whole cup. The amount of steam that is used, of course, varies with the weather. We do not have as much trouble in 30° below zero weather as we do when the thermometer is in the neighborhood of zero, accompanied with a severe northwest wind.

Question No. XXII.—"Can you give an instance of any attempts made in any city of the United States, outside of Philadelphia, where the gas company endeavors to preserve a constant candle power throughout the distribution system within reasonable limits, and under all conditions of weather and temperature? If the gas is water gas, or mixed coal and water gas, how is this accomplished?"

ANSWER BY THE BUREAU OF INFORMATION.

The question is taken as referring to the principles laid down in the paper on this subject, read before the 1906 meeting of the American Gas Institute, by Mr. W. H. Gartley, and now adopted in Philadelphia. In brief, they are as follows:

1. It is recognized that illuminating gases depend for their light giving quality to some extent on their hydrocarbon vapor constituents and are, therefore, influenced in their candle power intensity by exposure to cooler temperatures; that is to say, when a gas is cooled below the lowest temperature to which it has been previously subjected, there will be a certain falling off in candle power, depending upon the quantity of illuminating vapors carried by the gas and the tension of those vapors.

2. The extent to which the candle power is influenced by cooling any given quality of gas may be determined by passing the gas, as manufactured: First, upwards through a coil immersed in water by which the gas, never having been reduced to that temperature, is cooled to 70° F., and then passed through another cooling coil in which it is cooled to lower temperatures, say 60° F. 50° F., 40° F. and 35° F., and by means of a bar photometer the loss in candle power, due to cooling below 70° F., is noted; that is to say, after the gas has passed through the 70° F., coil its candle power is observed. It is then cooled through another coil to 60° F., and its candle power is observed. Another sample is taken (same general gas, made from same materials, in same way) and its candle power measured after passing through the up-coil at 70° F., again measured after passing through the second coil where it is cooled to 50° F., and so on down to the lowest temperature with which the gas will meet in the mains in the winter time. By this means a curve is made that will show the loss of candle power of the gas from inlet of commercial holders, due to subsequent cooling in the mains.

3. It is pointed out that the gas may be cooled in the mains to a temperature not indicated by a thermometer placed in the mains at any one point in the town; that when a gas is cooled to a lower temperature in the mains, as for instance, by passing under a bridge, or by the main approaching the surface of the ground, it will not be saturated with illuminating vapors at any subsequent high temperature. It is necessary, therefore, to know, not the temperature of the gas at some one point in the center of the city, but to know the temperature at which the gas is saturated with illuminating vapors at that point, and this is done with the hygrometer (now much simplified), a sketch of which accompanied the above mentioned paper, read before the American Gas Institute in 1906.

The candle power of the gas at its inlet to the commercial holder is determined by passing the sample of this gas to the photometer through a coil which is kept at a uniform temperature throughout the year, and which must be below any temperature that the gas has previously met in its passage through the works, and which is maintained in Philadelphia at 70° F. By this means the candle power of the gas in the commercial holder, if cooled to 70° F., will always be known. Knowing the temperature, from the hygrometer, at which the gas is saturated with illuminating vapors in the mains, and knowing from the chart the loss that will be brought about in this gas by cooling of any given number of degrees, it is clearly possible to forecast what the candle power of the gas must be in entering the commercial holder to deliver a uniform candle power in the center of the city. Again, it is stated that there is no wide departure from this candle power throughout the city, unless the gas should meet with some material cooling in its passage to some portion of the outlying districts. It is not necessary to read the candle power of the gas at the outlet of the commercial holder, which experience proves is influenced by the atmospheric temperature.

A coal gas is less influenced by reduction in temperature than water gas, because it contains less vapors and is of a lower candle power. It also has probably been cooled to a lower temperature in its progress through the works to get out the ammonia; but where a comparatively dry coal gas is allowed to mingle at the higher temperature with the water gas, when they come together the coal gas will become saturated with the vapors dropping out of the water gas to such an extent that a curve made for water gas will probably suffice for mixed coal and water gas up to probably 40 per cent. coal gas and 60 per cent. water gas.

In Omaha the gas company endeavors to preserve a constant candle power throughout the distribution system, and has succeeded in delivering a uniform candle power to the consumer within a variation of approximately 1-candle power under all conditions of weather and temperature. The gas manufactured and distributed in Omaha is carburetted water gas.

The methods followed in Omaha for obtaining a uniform candle power at a distance from the works resemble very closely those adopted in Philadelphia. The method of operating followed by Mr. W. H. Gartley, and at Omaha, has for its object the maintenance of a standard, uniform, candle power of gas in the street mains, as determined by the candle power observed at an outlying test station, and involves the use of a working photometer at the works which measures the candle power of the gas at the inlet of the storage holder instead of on the outlet, the gas first passing through a coil of constant temperatures, this temperature being below any temperature to which the gas may have been previously subjected. By the means of a "dew point hygrometer" used at the test station, the minimum temperature, to which the gas has been subjected, previous to reaching the test station, can be determined. By means of a curve, constructed from actual observation, comparing the candle power of the gas at the working photometer at its constant temperature, with the candle power of the gas at the test station at its observed dew point temperature, it can readily be determined what candle power is necessary to be carried at the inlet of the storage holder in order to deliver, at the test station, the standard candle power.

In Omaha the gas tested at storage holder inlet is first passed through a 35° F. up-coil, the top of riser being provided with a cotton scrubber that is changed every 12 hours. In Philadelphia a 70° F. coil is used. In both Omaha and Philadelphia the gas tested at test station is not passed through any coil, but is taken at room temperature, which will average about 70 F., and, of course, all tests are corrected to standard pressure and temperature. Omaha's experience bears out the statement made by Mr. Gartley in his paper that: "With this method in use, no importance need be attached to loss of candle power from friction in the mains and other vague causes." While there are some slight differences in the methods followed in Omaha and Philadelphia which give slightly different results, at the same time Omaha's experience has confirmed Mr. Gartley's fundamental principles, which may be summed up as follows:

In order to deliver a uniform candle power water gas to the consumer, the following conditions are necessary:

Uniform generator house practice.

Gradual and sufficient condensing.

Careful regulation of temperature conditions in purifiers.

Careful candle power observations at inlet of storage holder, the gas passing through a coil of constant temperature, which would be below the temperature to which the gas has been previously subjected.

Maintenance of temperature of gas in storage holders above street main temperature by the use of steam or hot water, if such is required.

Removal of oil condensed on the surface of the water in storage holders as fast as deposited.

Observation of hydrocarbon dew-point at a given distance from the gas works.

Observations of candle power at a given point where dew point is observed.

Determination of candle power required at inlet to storage holder in order to deliver desired candle power at street temperature, as indicated by hygrometer.

Finally, after the accumulation of sufficient data, in order that the desired candle power can be delivered, a chart should be made which will show the necessary candle power that must be carried at outlet of constant temperature coil of storage holder when the dew-point at the delivery point is known; and this chart will differ more or less for each city according to local conditions.

Question No. XXIII.—"Will you state the relative illuminating efficiencies of the eight (8) foot E. H. lava tip, the Sugg "D" Argand and the Carpenter burner, each consuming gas at the rate of five (5) cubic feet per hour:

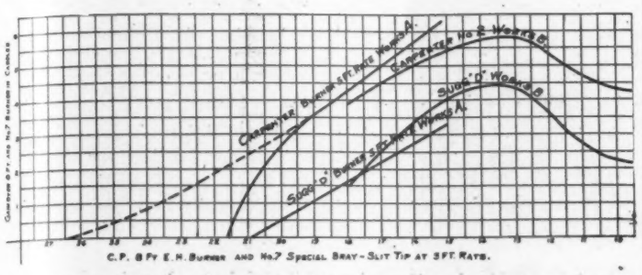
"1. On coal gas of from eight (8) to eighteen (18) candle power?

"2. On water gases of from fifteen (15) to twenty-five (25) candle power, these candle power ranges being based on determinations with the eight (8) foot E. H. lava tip?"

ANSWER BY THE BUREAU OF INFORMATION.

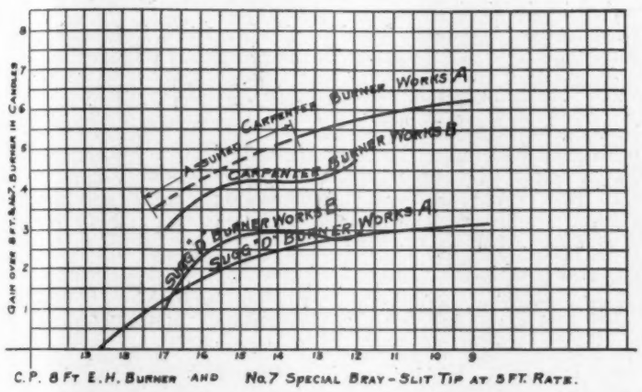
As an answer to this question involves the securing, for the purpose of test, both water gas and coal gas of a wide range of candle power, the difficulty of getting such gases at any one works to supply the data will be very evident. The accompanying charts give the data from observations of gases at two different works, designated as Works "A" and Works "B," covering a range less in extent than the question mentions. The lower candle power at Works "A" were secured by the elimination of the illuminating vapors through cooling of high candle power gas.

To the extent of the difference involved between an ordinary 18-candle power water gas, for instance, and an 18-candle power water gas produced by the cooling down of say a 23-candle power water gas, the data is debatable; but as the consumer in a large majority

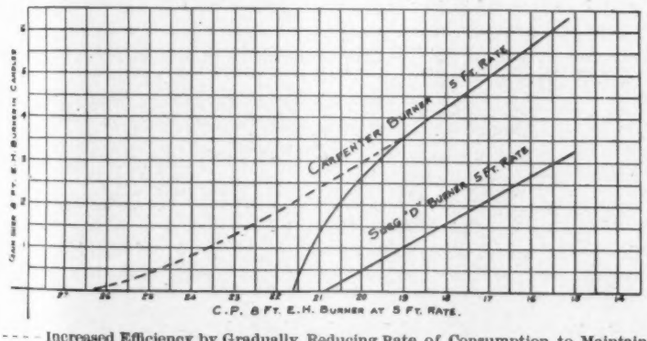


- - - - - Increased Efficiency by Gradually Reducing Rate of Consumption to Maintain Most Efficient Flame Height.

Curves Showing Relative Efficiency of Sugg "D" and Carpenter Burners, Compared to 8-Foot E. H. Burner and No. 7 Special Bray Slit Tip at 5-Foot Rate.—Water Gas. Works A and B.

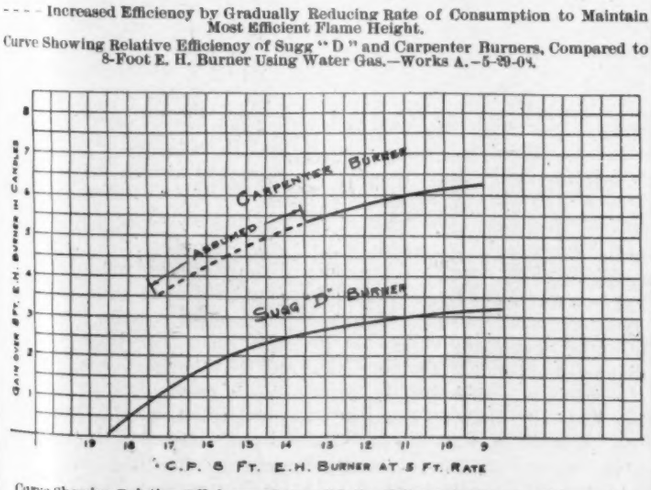


Curves Showing Relative Efficiency of Sugg "D" and Carpenter Burners Compared to 8-Foot E. H. Burner and No. 7 Special Bray Slit Tip at 5-Foot Rate.—Coal Gas.—Works A & B.



- - - - Increased Efficiency by Gradually Reducing Rate of Consumption to Maintain Most Efficient Flame Height.

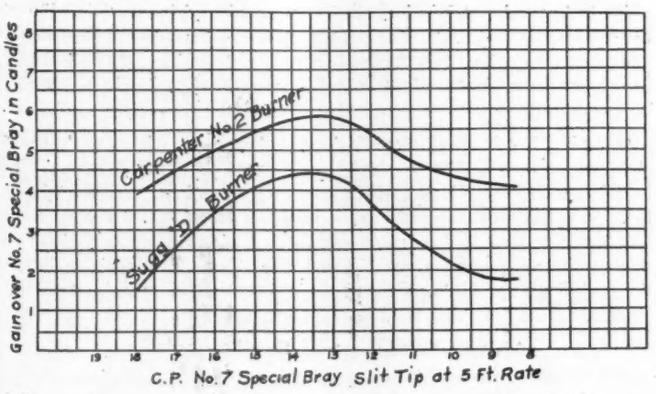
Curve Showing Relative Efficiency of Sugg "D" and Carpenter Burners, Compared to 8-Foot E. H. Burner Using Water Gas.—Works A.—5-29-08.



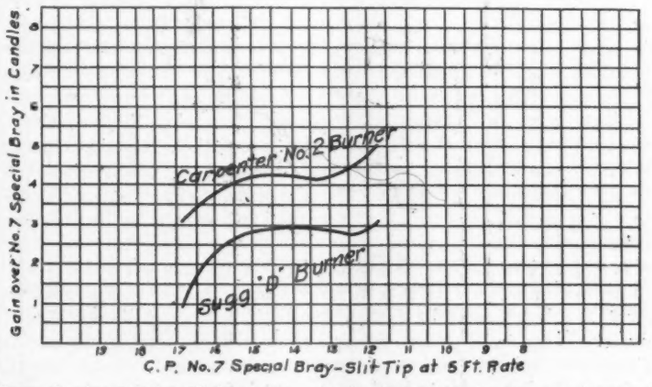
Curve Showing Relative Efficiency of Sugg "D" and Carpenter Burners Compared to 8-Foot E. H. Burner at 5-Foot Rate, Using Coal Gas.—Works A.—5-29-08.

of the works, for a large portion of the year, gets a gas that is the result of the cooling down of a high candle power gas, the practical value of the data thus given is enhanced instead of reduced.

Above 19.2-candle power of the 8-foot E. H. lava tip the Carpenter burner is seen to decrease in efficiency very rapidly, and crosses the line of the E. H. lava tip at 21.6, if the gas is burned at 5 feet per hour, or approximately thereto. This is due to smokiness and the flame burning above the chimney. In a number of works the agree-



Curve Showing Relative Efficiency of Sugg "D" and Carpenter No. 2 Burners, Compared to No. 7 Special Bray Slit Tip at 5-Foot Rate, Using Water Gas.—Works B.—9-02-08.



Curve Showing Relative Efficiency of Sugg "D" and Carpenter No. 2 Burners Compared to No. 7 Special Bray Slit Tip at 5-Foot Rate, Using Coal Gas.—Works B.—7-20-08.

ment with the State or municipality specifies that, for test, the gas shall be burned at the rate of 5 feet per hour and, therefore, in such cases the Carpenter burner is not more efficient than the 8-foot tip above, say, 21 to 22-candle power. If the flame in the Carpenter burner is kept at most efficient height by reducing the consumption as the candle power increases, it gives more efficient results than the 8-foot E. H. lava tip up to 26.5-candle power.

The Bureau is able to give herewith curves obtained at two different Works, Works "A" and Works "B." At Works "A" the efficiencies of the Carpenter and Sugg "D" burners referred to the 8 foot, E. H. lava burner, for both coal and water gas, have been compared. At Works "B" the efficiencies of the Carpenter No. 2 and Sugg "D" burners referred to the No. 7 Special Bray, for both coal and water gas, have been compared. Charts are also given in which the results for both Works "A" and Works "B" are combined.

In the water gas the curves at Works "A" and "B" do not vary very much, and have the effect of spreading the curve over a much greater range. In the coal gas there is a serious divergence for a portion of the curve. Of course, the burner used at Works "B" may have given different results from the burner used at Works "A," the kind of gas might affect these burners differently, and the two Works may not agree in photometric methods. Looking back on the tests, made in London by the Gas Referees, between the No. 7 Bray Economizer and the Carpenter burners, it is found that their results agree more nearly with those obtained at Works "A" with the E.H. lava tip. The London *Gas World*, March 2, 1907, gives for quite a lengthy period the results of tests of London gas by the Bray No. 7 Economizer, flat-flame burner, and the Carpenter No. 2, Metroplitan argand. These results show coal gas and mixed gas of from 11.9 to 9.5-candle power by the flat flame to yield from 16.6 candles to 15.2 candles by the Carpenter argand. These figures are merely the arithmetical averages of a great number of readings and at the various stations of three companies; they do not show the results of tests of any one given gas by the two burners. Consequently, these figures are not precisely comparable with those given from Works "A," but they in general support these results. As is stated, at Works "A" the low candle power gases were obtained by cooling richer gases and thus lowering their candle power, whereas the London gases were probably of normal quality; this would probably somewhat effect the comparative results of the London tests and those of Works "A."

The tests made at Works "B" were made with a genuine Sugg's argand burner obtained in England, which is an official burner and gives better results than those obtained in America. At this Works they have never been able to obtain a genuine Sugg's argand burner in this country.

Question No. XXVII.—"We have a few cases where we have installed gas ranges that we find the walls of the kitchen sweat very badly and the installation of the gas range has been quite detrimental. We have exchanged stoves in some of the places where this complaint is and it does not remedy conditions; we have also ventilated the rooms more, and in one case there is a register in the floor above, and when this register is left open the room above also sweats. How may this condition be remedied?"

ANSWER BY THE BUREAU OF INFORMATION.

The sweating of the kitchen walls, due to the installation of a gas range, is, of course, caused by the condensation of the water vapor formed by the oxidation of the hydrogen in the gas. The degree of sweating will, it seems, probably increase with the decrease in thickness of the walls and their consequent cooling by the outside air. It is possible for one particular cold spot of a room wall, and even chimney, to show sweating, while the other and better protected and warmer portions of the walls are free from it.

There seem to be several methods of preventing the sweating of the walls of a room where a gas range is installed. One is to change the range, another to better the ventilation, and still another is to prevent the escape of the products of combustion into the room. The first two may or may not be remedies, so the last seems to be the only sure preventative of the trouble.

The question hardest to answer is, "Why does a stove sweat in some houses and not in others using the same gas?" The only answer to this seems to be that one room is better ventilated than the other. There have been several cases where complaints of this character have been corrected by simply changing the range, and the only conclusion seems to be that the ventilation of the room was sufficient for a good range, but insufficient for a poor one. There is, of course, a relation between the effective ventilation of a room and the quantity of water vapor that can be permitted to escape into the room without giving trouble from sweating, and it may be that when these are nearly in balance a slight change in the efficiency of a stove, or in the quality of the gas, might throw the balance one way or the other.

It seems impossible, however, to forecast the result of a change of stoves, and the only sure method to adopt when a case of sweating is encountered is to prevent the escape of the products of combustion into the room. This can best be accomplished by installing a closed top range with flue connection to the chimney instead of the ordinary type of open top range.

Question No. XXVIII.—"Concerning the deterioration of diaphragms and metal parts:

"a. Do frequent changes in kinds of oil in the water gas machine directly or indirectly impair the diaphragms in consumers' meters?

"b. Would gas for a period of, say 6 months, containing hydrogen sulphide or carbon bisulphide to the amouut of 5 grains per 100 cubic feet, damage the diaphragms and metal parts of consumers' meters to any considerable extent?

"c. Does vaporized hydrocarbon or gasoline, introduced into gas mains for the purpose of freeing them from naphthaline, have any bad effects on the diaphragms of consumers' gas meters; and how much?"

ANSWER BY THE BUREAU OF INFORMATION.

Owing to the lack of data, and the short period of time for making experiments, the Bureau is able only to make the following general remarks:

Referring to paragraph "b": In two cases coming within the experience of one of the members of the Bureau, in taking over plants where the purifying capacity had been insufficient and where hydrogen sulphide had been present in the finished gas continuously, it was found that no serious damage had been done to the diaphragms or metal parts of consumers' meters. Carbon bisulphide frequently appears in the best purified gas in much larger amounts than stated, and no instances are known of its having done any damage, except possibly in the way of bleaching the diaphragms, and its effect would be too small to be appreciable. Ammonia, even in small amounts, is much more likely to cause damage than the sulphur compounds.

The same Bureau member also makes the following comments relative to paragraph "c:" Vaporized hydrocarbons of various character, if in sufficient quantity, will affect the diaphragms of consumers' meters by dissolving out some of the heavier oils used to soften and keep them pliable. In extreme cases diaphragms have been known to become bleached in a very short time from the excessive use of hydrocarbon oils for clearing naphthaline from mains and services. It is also true that gases enriched with the lighter hydrocarbons are apt to produce this effect on a general district, but how much, or just what porportionate effect is produced by the use of different quantities and different qualities of these hydrocarbons is yet apparently open to experiment.

ANSWERS-AT-LARGE.

By Mr. J. Hawley Taussig, Philadelphia, Pa.—(a.) Experience has shown that the detrimental constituents of any carburetted water gas for meter diaphragms are the hydrocarbon vapors, consisting mostly of the benzol group. These vapors, when condensed or absorbed by the diaphragm oil will (as explained by Mr. J. M. Rusby in his paper read before the American Gas Institute in 1906) wash out the softening and protecting oils in the diaphragms. When later evaporated during a season when the gas is under-saturated, the diaphragms will be left in a bleached and porous state. The quantity of these hydrocarbon vapors will, of course, regulate the degree and speed of this washing process. The bleaching or drying part comes with the season of the year. We have found that by the use of some oils we get many more bleached diaphragms than with others. Therefore, if we change from an oil where there is much hydrocarbon vapor made in carburetting, to one where there is comparatively little, we will get a better condition for consumers' meters, and the reverse is true of the opposite condition. Diaphragms will not be impaired by frequent changes in carburetting oil unless the changes bring oils into use that result in more hydrocarbon vapors in the finished gas.

(b.) Carbon bisulphide is usually present in gas after purifying with iron oxide in the usual manner. In our works we send out more than 5 grains per 100 cubic feet. This, after years, has shown no detrimental effect. We have no experimental data as to whether 5 grains of H_2S per 100 cubic feet of gas will injure diaphragms or metal parts, nor have we heard of such an experiment being made. We believe, however, that there will be no appreciable injury in 6 months' time under such conditions.

(c.) The use of vaporized hydrocarbons or gasoline introduced into the gas will have only the effect of hastening the washing and bleaching process, thus making the meter diaphragms porous and stiff, and causing the meters to prove fast. In that condition they will probably not pass the slow motion test and will have to be re-oiled.

With the dipping process, explained by Mr. Rusby in the paper above referred to, there will be no bad effects from the use of any hydrocarbon, either present or put into the gas artificially, as it prevents bleaching entirely.

By Mr. J. M. Morehead, Chicago, Ills.—(a.) In my opinion changes in the kind of oil used in a water gas machine do not affect the diaphragm of the consumers' meter. Any change in the oil will mean merely a change from one kind of mineral oil or distillate to another kind of mineral oil or distillate of practically the same chemical composition, and while such changes would affect the amount of tar and other conditions in the generators, I think the products of distillation which eventually reach the consumers' meters would be the same. That is to say, the methane and illuminants which result from the oil added in a gas machine are practically independent of whether the enriching material was crude oil, gas oil or naphtha.

(b.) The long continued exposure of the working parts of a meter to gas containing a large amount of carbon bisulphide, or sulphuretted hydrogen, would result in the deterioration of those parts. The effect, however, would be greater upon the metal than upon the oil-soaked diaphragm, although both the metal and the other parts would suffer.

(c.) I do not think that the introduction of gasoline or other vaporized hydrocarbons would affect the mrter diaphragms. If large quantities of gasoline came directly in contact with the diaphragms, some of the animal oil with which diaphragms are treated would be dissolved, but the amount of vapors carried along from the gasoline introduced into the mains is so small that, so far as the diaphragm is concerned, it amounts to having a gas with a small percentage more of illuminants. Chemically, and in other respects, gasoline vapors behave precisely as benzine vapors which comprise a very large part of the illuminants ordinarily found in water gas.

Question No. XXX.—"What is the relative value of inclosed and open 60-inch and 100-inch bar photometers?"

The Bureau of Information has received one answer-at-large to this

question, which goes into the subject so satisfactorily that it accepts this answer as its final answer.

ANSWER-AT-LARGE.

By Mr. C. O. Bond, Philadelphia, Pa.—It would seem that the question is meant to cover two points; the relative accuracy of, first, inclosed and open photometers; second, of 60-inch and 100-inch bars. For a reply to the second part, the inquirer is referred to the 1907 report of the Committee on Methods of Taking Candle Power of Gas.

As to the first part, both open and closed bar photometers claim their advantages, not through any principle involved, for the photometric principles are identical, but in the adoption of exterior conveniences, either for the comfort of the photometrist, for the prevention of draughts, for the protection of the photometer disk from extraneous light or for some other reasons.

With the inclosed photometers, as the name indicates, the light sources are in compartments of limited size, connected by a tunnel in which is placed the disk. The object is to preserve an extremely quiet flame and, at the disk, to exclude all light other than from the compared sources.

The photometrist also is, to a greater or less extent, forced to place his head in the inclosed part, to his discomfort, especially in hot weather. In the attempt to properly ventilate these flame compartments there is often created a local draught which defeats the very object sought. At any rate the temperature of the inclosed portion is measurably raised, and as a rule the effects of vitiated air are more apparent than with the open photometer. The inner surface of the tunnel also may become appreciably reflective, thereby causing an error.

The open photometer permits the burning of the flame in a natural manner. The prevention of draughts is then a question of room construction. The flames may be viewed from many angles, instead of through a sight glass, to insure their proper condition. The photometrist stands or sits naturally while at his work.

It has been considered necessary with open photometers that the room must be light, tight and painted black, and it is good practice to follow that plan from the beneficial preparation it gives the retina for accurate work. But a scientific investigation of the subject, by Dr. E. P. Hyde, has been published at the Bureau of Standards, Washington, in which it is clearly demonstrated that, with sufficient light diaphragms interposed along the path of the rays from the light sources to the photometer disk, no error results, even when the walls of the room were white and two other lights were burning in it, the windows being curtained. [See reprint No. 20, Bureau of Standards.]

From the above facts it would appear that the open type of bar photometers is much to be preferred.

Another point may be added: In case of fire caused by either of the flames, it can easily be gotten at in an open photometer, while in a closed one it cannot.

ADDITIONAL QUESTION.

Question No. XXXVI.—"What is the mean spherical candle power of the standard candle? Is there any objection to taking readings of candle power at the angles used for determining mean spherical candle power instead of every 10° or 15°, as customary at present? It would greatly simplify the present method of determining mean spherical candle power?"

Special English Correspondence.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, August 10th, 1908.

The Hella Bushlight.—Assisted Distribution in Scotland.—Accounts of the London Gas Companies.

In wandering through the extensive grounds comprising the White City at Shepherds Bush—to give the popular title that has been attached by common consent, to the Franco-British Exhibition—one comes across isolated exhibits that have apparently wandered out of their proper location. Generally speaking the grouping of the various sections is excellent, and it is possible, with the aid of the guide book, to locate any special exhibit, but there are exceptions, and one is the Hella Bushlight, which is shown in a small pavilion in the amusement department, and when lighted up after dark, forms an attractive object. In examining the profuse display of lighting made by the company interested in this invention, I was handed a leaflet which set forth that further particulars could be obtained from an address in London. An application was accordingly made several days ago in the hope that some details as to cost and consumption of gas would be received in time for use in this paragraph. But no response being forthcoming I can only deal with the subject in a general way.

For nearly 20 years the mantle has had the course to itself. But it will be remembered that at an earlier period several devices were put forward, such as the Lewis platinum burner, the Clamond magnesia basket, and the Fahnehjelm comb, which aimed at producing incandescent light. Platinum and magnesia were then almost the only materials available, cerium, thorium and such like metals and their salts being simply scientific curiosities. The Welsbach patents, while they lasted, covered so much ground that they probably hampered investigation as to the applicability of the rare metals in other ways. After all, the mantle is somewhat of a hot house plant. Given a good maintenance scheme, under which it is properly cared for by those who are directly interested in its success, a thoroughly successful showing can be made with it. But it is scarcely fitted to be turned out on the rough and tumble conditions of everyday life, and in the hands of careless or hostile parties its defects can readily be exaggerated. Gas companies would be glad to hear of a reliable contrivance that secures greater strength without loss of duty per cubic foot, and the Hella Bushlight claims to meet this requirement. The essence of the invention consists in a method of combining the rare metals which secure such excellent results in the "mantle," with a material that can be moulded into rods or other suitable shapes. As exhibited it consists of a flat disk suspended or held in position from above, from which depend clusters of rods of various lengths, the rods occupying the position of the "mantle" over an atmospheric burner. The cluster may be taken off, plunged into water whilst still hot, and immediately replaced over the flame, without the slightest detriment, and may also be subjected to lively mechanical shock or vibration. If the claims advanced on its behalf can be substantiated in practice, and the price is reasonable, there should be a good future for this contrivance. But it is to be hoped that the proprietors will not hamper its adoption, and encourage imitation, by trying for too high a price. This is a mistake that has crippled many deserving novelties.

At the recent meeting of the North British Association of Gas Managers in Edinburgh, two extremely interesting papers on the subject of high pressure distribution were submitted. Taken together with the discussion, it is evident that this subject is attracting much attention in Scotland, and that cases of small, isolated villages, where the cost of the usual low pressure main would render the supply at least a doubtful speculation, are being reconsidered in the light of modern advancements. The special interest attaching to the papers lies in the fact that they describe work actually carried out and now in operation, which is always an attractive feature. And although in each instance the authors are modest and refer to published particulars, etc., it is evident that a great deal of original work of a pioneer character had to be undertaken to suit the special circumstances. There is a great deal more than a slavish imitation or following of previous results. In the course of the proceedings some difficulty was found in differentiating between high and low pressure distribution, and it would be well to discard these terms, which define nothing, in favor of "unassisted" and "assisted" distribution, because the real point at issue is not the relative number of tenths or inches at the outlet from the works, but whether the motive power is simply the weight of the holder or some mechanical device of the nature of a pump. If one engineer has, say, 10 inches holder pressure available, he may actually have a higher outlet pressure than his neighbor who resorts to mechanical distribution. There was also a tendeney to minimize the effect of an increased pressure on leakage. No one will pretend that any system of pipes, covering several miles, is in any sense bottle tight, and all other things being equal, the effect of increasing pressure must also increase the quantity lost. By reason of increased consumption the actual percentage of loss may be reduced, but that is a different thing. But one might be forgiven for taking some of the utterances to mean that the way to reduce the loss is to increase the pressure. One of the authors carefully tested the existing system as a preliminary step, and found that the mains themselves were fairly tight and that most of the loss was in the services. Two interesting ideas were described in the papers. The first was the plan of using one step-down pressure regulator for each block of 16 to 20 houses, in preference to one for each house. And the second was a means of securing automatic regulation of the compressing or pumping machinery by means of a small pipe of block tin, ¼ inch diameter, carried inside the trunk main to the far end of the district. It is an application of the idea

already applied to exhausters, where a governor ball, connected with the inlet, rises and falls with variations of pressure and adjusts the supply of steam and consequently the speed of the exhauster in accordance therewith. One gentleman mentioned in this connection that instead of connecting the exhauster governor immediately at the inlet to the exhauster, he made a connection from a suitable point on the hydraulic. This is a wrinkle worth considering, as it stands to reason that a connection from a central position on the hydraulic main will give better results than one close to the exhauster inlet. The author argues that as the point desired in the gas works is to maintain an even gauge on the hydraulic, so the secret of efficient distribution is a sufficient pressure at the farthest point. So far his arrangement has worked well in practice. There are boxes on the line of main for collecting condensation and which can also be adopted for isolation of particular sections of main for testing soundness, and the return pipe is so arranged that it can be tested at these points. Questioned as to risk of disturbance by reason of accumulation of water in the return pipe, the author pointed out that as there was no flow through the pipe, the work end being practically blocked, that very little condensation would occur. The pipe might if desired be filled with dry air or gas in the first place. But the presence of water in the pipe would not hinder the transmission of pressure. Another interesting point was elicited, and that was the fact that a high pressure main can be tested in sections if slide valves or other quick closing devices can be used, without affecting any consumers other than those on the section under test, because the main acted as a reservoir, and if charged at full pressure would maintain the supply in the district beyond the section under test for a sufficient time to enable an observation to be taken. It would follow that this could be also done while tapping in a new service if required, thus avoiding all risk of loss or injury to the workmen by escaping gas.

The reports of the London Gas Companies for the half year ending 30 June last, have been issued to the shareholders, and as usual they indicate in a general way the state of affairs throughout the country. Climatic conditions have not been encouraging to consumption of gas during the last 3 months of the period concerned. There has been an unusual proportion of clear, cloudless evenings, delaying the period of lighting up, and encouraging people to remain out of doors. Consequently the Gas Light and Coke Company only show an increase of ¼ per cent., while the South Metropolitan have a decrease of nearly 2 per cent. The last named raised the price 3d. per 1,000 cubic feet in January, and this always has a discouraging effect on consumption. It is evident from the connection between hours of darkness and consumption of gas that the lighting department of the gas industry is still the most important one, notwithstanding the endeavors that are systematically practiced in certain interested quarters to convey the impression that gas lighting is quite out of the running. There is some reduction in the price of coal, but not so much as was expected, and this synchronizes with the general impression amongst buyers of gas coal that the state of trade generally would warrant a substantially larger reduction than has actually been secured, and that the price of gas coal has been artificially maintained by means of skilfully arranged concerted action. The tendency during the last few years has been to stiffen the market by every available means in the spring. Cheap lots are hawked about the country in March and April, and any loss due to parting with a small lot at a low price is amply covered by an addition to the annual contract rate. A few large contracts are secured and utilized as a fulcrum for further pressure. The excellent position of the coke market, already referred to, has been of excellent service, and but for the aid of this residual a serious position would be created, seeing that the price of coal at the collieries at present is 20 to 40 per cent. higher than 3 years ago. The South Metropolitan also direct attention to the large increase of cost in the distribution department as compared with 10 years ago. This is a matter that is felt by every gas company. The extensive adoption of the incandescent light and improvements in stoves have enormously popularized gas by increasing efficiency and reducing cost, and as such have tended to increase business. But at the same time they have reduced the average per consumer, and much of the expenditure in the distribution department turns more on the number of consumers than on the quantity of gas sold. The slot meter class of business requires more frequent collections and altogether more attention than the ordinary or quarterly kind. So that any improvements due to the adoption of regenerator or other improved modern settings, drawing, charging and conveying machinery, etc., are utilized to meet the increased distribution expenses, rather than applied to reduce the selling price of gas. And this meets the popular requirement. The average consumer would sooner have his fittings and burners examined and overhauled if necessary, competent advice and instruction as to the use of stoves, periodical cleaning of gas atmospheric burners, and similar assistance, than be left to his own devices, with gas perhaps 2d. per 1,000 cheaper.

Items of Interest
FROM VARIOUS LOCALITIES.

THE Mayor having signed the ordinance recently adopted by the City Councils of Richmond, reducing the gas rate to 90 cents per 1,000 cubic feet, the same becomes effective February 1, 1909.

AT the special meeting of the shareholders in the Nashville, Tenn., Gas Company, held the 18th inst., called to consider the issuing of new stock in the sum of $350,000, the policy of further delay was determined upon. It is a pity that a property with so great an earning capacity is not in the hands of active business men.

THE contract for the construction of a water gas set on the plant of the Rome (N. Y.) Gas, Electric Light and Power Company, has been awarded to the Western Gas Construction Company.

THE Springfield (Mass.) Gas Light Company is engaged in an effort to deepen the Windsor canal sufficient to enable "light draft" canal boats to get from the Connecticut river to its bulkheads. The present depth of the canal is something less than 5 feet, and 6½ feet depth of water would be sufficient. In the event of that depth having been obtained, an appeal to Congress will be made for an appropriation sufficient to put the canal in shape to admit boats of good tonnage. In the latter event gas and steam coal could be sent direct from Perth Amboy, N. J., to Springfield at a saving of certainly not less than 75 cents per ton.

THE Wyandotte Gas Company, of Kansas City, Kas., has paid into the city treasury the sum of $5,333.66, representing the franchise tax of 2 per cent. on the business done by it for the first half of 1908.

THE Kalamazoo (Mich.) Gas Company is engaged in reforming and enlarging its office quarters. The correspondent who wrote us this, also said: "This structure when completed will be a decided addition to the office buildings along Rose street front, for it is to be of ornate appearance. The Company's business gains right along, which is not to be wondered at, for the city grows and the Company keeps rather ahead of than behind such growth."

LAST Friday the gas companies in the New York city district of the Public Service Commission were notified to attend a session of the Commission called for debating the regulations that have been framed in respect of the placing and use of gas meters. The pith of the rules (4 in number) as originally submitted is:

First.—No gas meter after having been put in use shall be verified or tested by anyone except an inspector for the Public Service Commission when a bill is in dispute or complaint has been made as to the accuracy of the meter.

Second.—Whenever a meter is removed by the Company, notice to that effect shall be served upon the occupant or owner of the premises from which it has been removed.

Third.—All meters that have been in use for 7 years or more shall be removed before November 1 next, and all others that have been in use more than 5 years shall be removed before January 1 next, and the same shall not again be put in use until they have been tested and approved by an inspector for the Commission.

Fourth.—Hereafter every gas meter that has been set for 5 years shall be removed within 12 months after the completion of the 5-year period and submitted for testing by an inspector for the Commission.

MR. M. E. SPRINGER, of Lincoln, Neb., is proposing the construction of a gas plant of modern type to serve the residents of North Platte, Neb. He has applied to the Council for a franchise, the rate named therein being put at $1.80 per 1,000, which certainly should be ample.

ON September 26th voters of South Side, a division of Phoenix, Ariz., will vote on a proposition to grant an operating franchise to the projectors of the South Side Gas Company.

THE new plant of the Bennington (Vt.) Gas Company will be sold at Receiver's sale on a date to be fixed some time in September; the sale will be the result of proceedings instituted by the bondholders and other creditors. We are informed that this is a well planned

and satisfactorily constructed works as to buildings and equipment, and that the main system comprises 12 miles of pipe, none of which is less than 3 inches diameter. It is claimed that 500 meters have been set, and that many other consumers are anxious to have a gas supply The Company was obliged to assume too heavy a debt in addition to the bonded issue of $40,000, and before the business could be well established the principal creditor demanded a receiver. Bennington is a town holding between 8,000 and 9,000 inhabitants, many of whom are living on their income, and the place itself, together with its surroundings, would seem to be an especially good location for a gas works. It is claimed that $90,000 has been invested so far in the enterprise, the receiver having put back all the earnings during his time of supervision into construction of one sort or another. It is not all unreasonable to assert that, with proper attention to business methods 900 meters could be put on the lines within a period of 2 years. Perhaps some of our friends of an inquiring turn of mind might find it useful to investigate the Bennington situation.

MAYOR W. B. KILPATRICK, of Warren, O., has vetoed the ordinance passed by the Warren Council, under which the Mahoning Gas and Fuel Company was granted the right in perpetuity to use the beds of the city's streets for pipe system through which to transmit either natural or artificial gas.

MR. ALEXANDER WYNESS has resigned the dual position of Manager and Superintendent of the Vincennes (Ind.) Light and Power Company to accept the place of Manager of the plant of the Winona (Minn.) Gas Light and Coke Company.

THE proprietors of the Clinton (Mass.) Gas Light Company were asked to put a price upon the gas and electric lighting plants operated by them in Clinton—the latter is very anxious to engage in the lighting business on municipal account. It was also requested that a schedule of its properties be submitted. The estimate and schedules were subsequently handed to the authorities, the upset or sales' value to the Company being put at $479,500. President Alfred Clarke also handed in a bill of expense in connection with getting up the estimate and schedules against the Selectmen in the sum of $150. We think the Selectmen were not at all expecting the latter.

MR. C. C. MATTISON, formerly on the business staff of the Nassau and Suffolk Lighting Company, of Hempstead, L. I,, has engaged with a mine operated in South Carolina, to act as selling agent for him. Mr. Mattison's headquarters will be in Knoxville, Tenn.

MR. W. H. FRITCHMAN, who has been managing the business of the Suffolk (Va.) Gas Company for some time with care and intelligence which usually mark his movements, informs us that they have concluded a series of demonstration lectures, illustrated by working examples of how to intelligently use gas in the kitchen. The demonstratress was Mrs. Virginia Bell, of Staunton, Va., the audience room was in the Company's headquarters on West Washington street, and everything that was cooked was consumed without expense to the consumer. The exhibition lasted the entire third week of August, and about every female in Staunton took advantage of the liberal opportunity afforded.

MR. JOHN F. BURKE, Superintendent of the Watervliet branch of the Municipal Gas Company, of Albany, N. Y., died the evening of the 18th inst. Deceased had arranged with General Superintendent Dunn for his vacation, which was to date from the 19th. Having finished these arrangements he started for his home. While walking along Broadway, right near the intersection of of Clinton street, he fell to the sidewalk. Help was immediately at hand, and the sufferer was speedily removed to St. Peter's hospital. He failed to recover consciousness. Death was caused by a cerebral hemorrhage.

AT the annual meeting of the proprietors of the Lansing (Mich.) Fuel and Gas Company the Directors elected were: R W. Griswold, E. F. Weak, B F. Davis, R. E. Olds, C. W. Fox, C. H. Geist and E. F. Cooley. The annual reports showed that the Company had enjoyed a prosperous year. The new plant, which is now being completed in North Lansing, at a cost of $250,000, will be fired up in November. The main system has been largely added to, and the extension is particularly noteworthy in that it includes a high pressure line to the Agricultural College in East Lansing, which main, of course, will also carry all the gas needed by the residents at large of that suburb.

WRITE to Messrs. John J. Griffin & Co., 1513 Race street, Philadelphia, Pa., for a copy of their handsome, illustrated and excellent descriptive new pamphlet, "The Positive Prepayment Meter."

UNDER the clever, competent guidance of Mr. Ernest L. Hospes, the Receiver for the properties of the Stillwater (Minn.) Gas and Electric Light Company, its main system is being surely brought to the point where complaint as to lack of service by the Company will cease.

MR. D. G. DONAHUE has been elected President of the South Range (Mich.) Gas Company, succeeding Mr. John Barich, resigned, and to his other duties as Secretary and Treasurer Mr. Jacob Jarvis has been induced to assume those of Vice-President. The Company is proposing to secure a franchise under which it may operate in the outlying village of Baraga.

THE Boston *Commercial* of the 22d inst., had this to say: "The July figures of the operating companies of the Massachusetts Gas Companies are issued. Boston Consolidated Gas reports net earnings of $57,115 as compared with $23,833 for July, 1907. This is the first month which compares with 80-cent gas, as the price was reduced from 85 cents per 1,000 cubic feet to 80 cents, on July 1, 1907. The fact that the first month to compare with the same price of gas in the previous corresponding month should show such a large increase is very important.

THE lighting of the grounds of the State Fair at Indianapolis, Ind., during the first week of its operation, would not have amounted to much were it not for the celerity and liberality of the Indianapolis Gas Company. The famous, or otherwise, Midway is ablaze with gas arcs, and the Company has been giving a sharp glance at the advertising possibilities of the fair. It is maintaining a large booth which is equipped with gas apparatus of the domestic type mainly, and two expert demonstrators are keeping up a continuous demonstration of the uses to which gas may be put in the household outside of the main matter of lighting.

"L. F.," writing from Memphis, Tenn., under date of the 27th inst., says: "Last week satisfied the Consolidated Gas and Electric Company, of Memphis, and it is working as rapidly as possible to remedy the complaints as to service made by the City Electrician, Mr. Robert E. Moran. The lighting committee of City Council, with the full assent of the acting Mayor, has granted the Company an extension of 1 month's time to complete the necessary betterments."

A JOINT meeting of the members of the Manufacturers' and Jobbers' Union and the local Board of Trade was held in La Crosse, Wis., the evening of the 21st inst. It was called to consider the proposition submitted by Messrs. J. M. Dunwoody and W. Wingard, of Minneapolis, who are seeking to interest capital along the Mississippi in a new transportation project which proposes the restoration of river transportation prior to the completion of the 6-foot channel. A committee will interview local business men with a view to determining how much trade could be guaranteed in La Crosse. The new concern is known as the Mississippi Gas-Electric Navigation Company, and proposes to operate a series of steel, whaleback packets between St. Paul and St. Louis, using producer gas and electricity as motive power.

THE City Commission has discontinued (temporarily, at least) the investigation of the Dallas (Tex.) Gas Company, which investigation seems to have had its inception in malice rather than from any desire to do public good.

MR. J. R. RITCHIE has been appointed Superintendent of Works, Peoples Gas Company, Shenandoah, Ia.

THE success of the pay station established in its Towson district by the Consolidated Gas, Electric Light and Power Company, of Baltimore, Md., has induced the Company to open a similar branch at Govanstown. In the latter place the station is in the premises of the Suburban Trust and Building Company.

AT the half-yearly meeting of the South Metropolitan Gas Company, of London, England, naturally too, the prepayment meter came in for a share of reference. As to the losing end of the measurer it seems that 6,315 of the meters were more or less damaged by the abstraction of coins therefrom, and the total amount of money stolen was $2,930. The cost of repairing the meters averaged 50 cents each, and of the total meters tampered with, 5,354 were in untenanted, or, as the record states, "empty" houses.

The Market for Gas Securities.

The expected is happening, and shareholders in Consolidated are again coming into their own, and a certain Hebraic contingent is getting its due. As soon as the market straightened out this morning (Thursday) attention was drawn to the trading in Consolidated. Closing last night at 140, the first sale was made at 140½, from whence it went to 143¼ by noon. The general strength of the market, of course, had much to do with it, but the main cause likely is some helter-skelter closing out of short accounts made around 130 by more than one fair-sized house in the Palestine contingent. In any event, the Company's present standing far more than justifies current quotations.

Brooklyn Union is up 5 points in the bid price, and Peoples, of Chicago, is 96¾ to ¾. Cincinnati Gas and Electric is 91, bid, and Mr. Kenan's friends are quietly chuckling. The activity in Washington (D. D.) gas continues.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

AUGUST 31.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid*	*Asked.*
Consolidated Gas Co.	$73,177,000	100	143	143¼
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	93	93½
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	3,500,000	100	130	160
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	92	96
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	98	104
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	100	105
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union—				
1st 5's, due 1947, J. & J.	1,250,000	1,000	90	98
Standard	5,000,000	100	70	100
Preferred	5,000,000	100	100	125
1st Mtg. 5's, due 1960, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	131	1311½
1st Con. 5's, due 1948, M. & N.	15,000,000	—	91½	92
Yonkers	299,640	509	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	2⅝	2¾
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	500,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
" " Bonds, 5's	5,250,000	1,000	62	66
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	29,500,000	100	90½	91
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	92	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90¼	91
Preferred	3,026,500	100	71	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,000,000	—	—	118
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	118
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	—	—	74½	75
Detroit City Gas Co	6,000,000	50	—	50
Prior Lien 5's	4,618,000	1,000	—	98
Detroit Gas Co., 5's	881,000	1,000	75	80
" nc. 5's	14,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	100	105
" Bonds, 5's	10,500,000	—	101	102½
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	86
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis.	10,000,000	100	—	100
Preferred	2,500,000	100	60	90
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	350,000	1,000	106	108½
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	54⅜	55¼
Preferred	25,000,000	100	87	88
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	6,000,000	—	127	133
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	96⅜	96¾
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104⅜	103½
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.—				
1st Mtg. 5's	751,000	1,000	92	—
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,445,000	1,000	96¾	—

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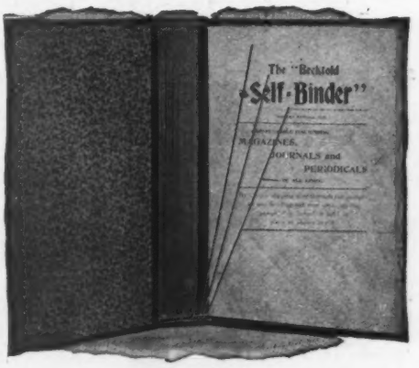

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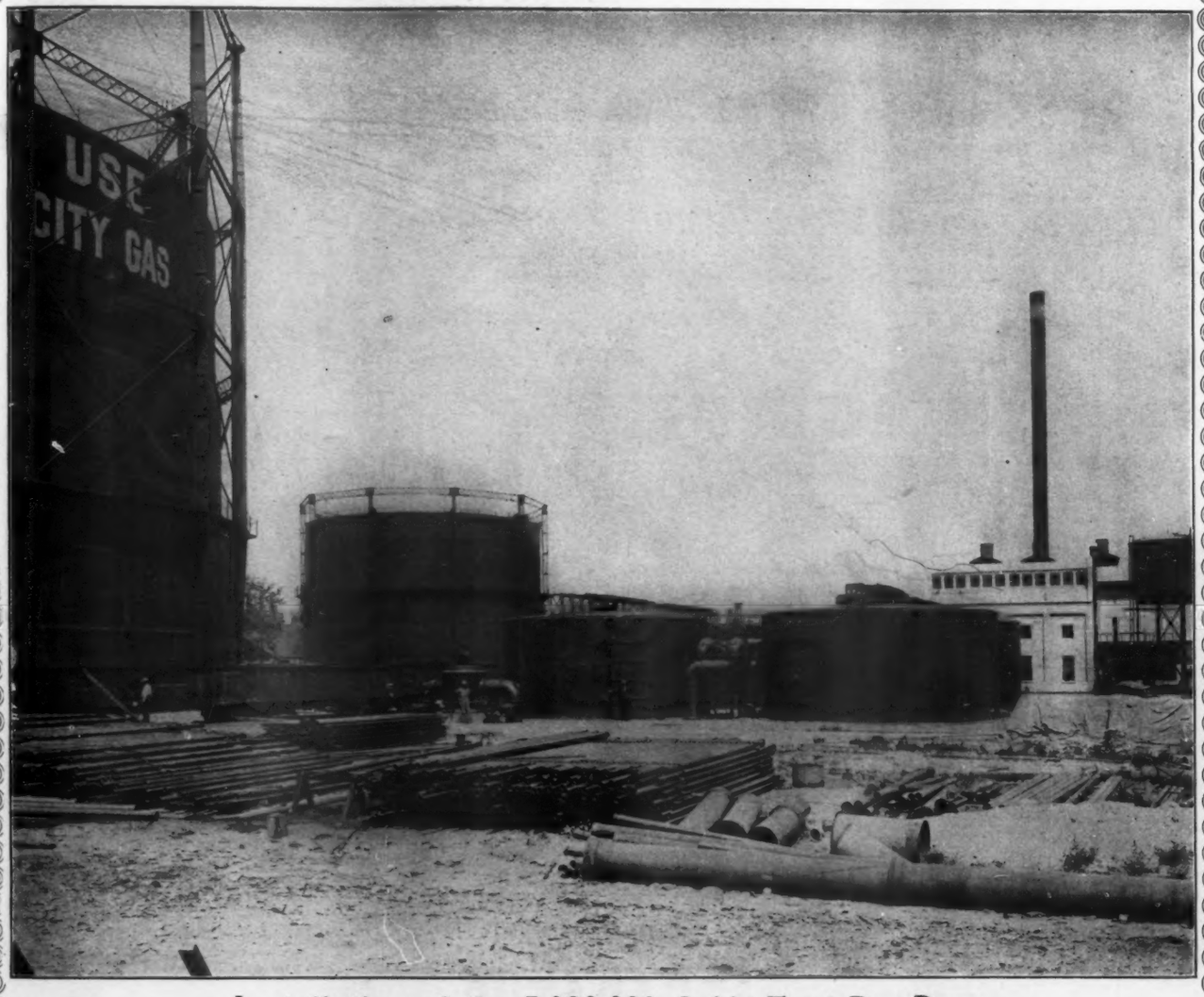

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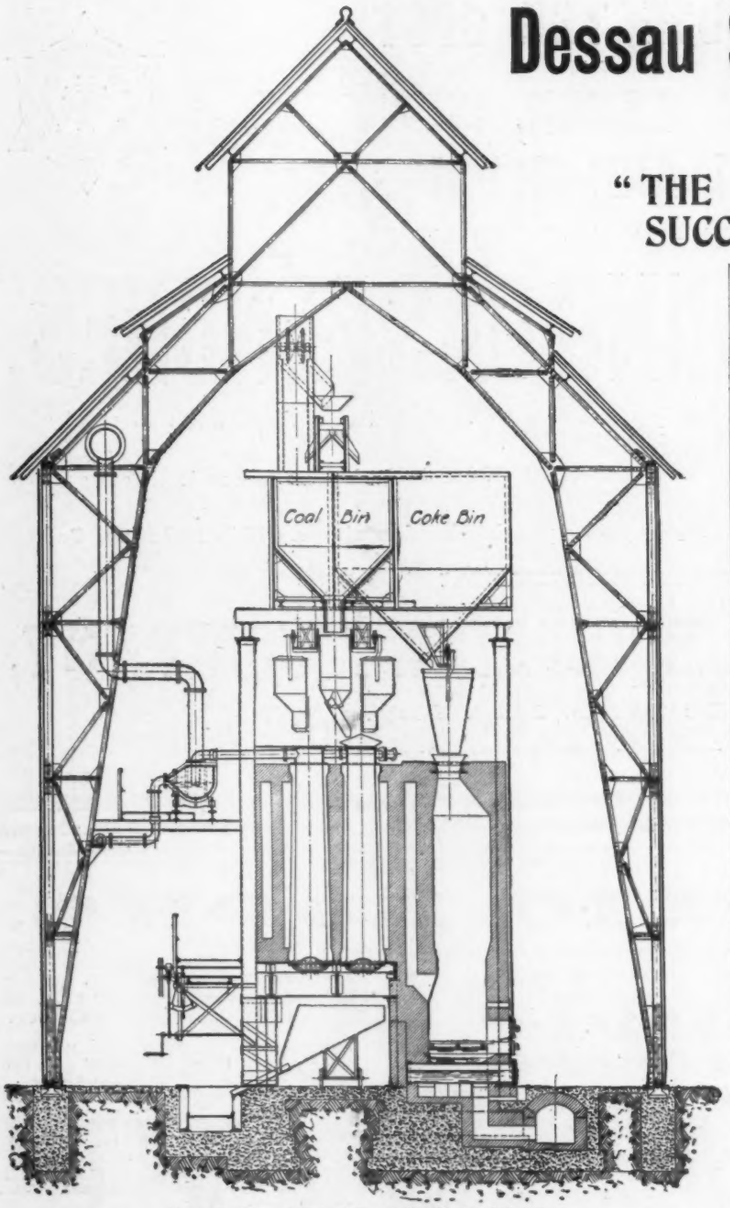

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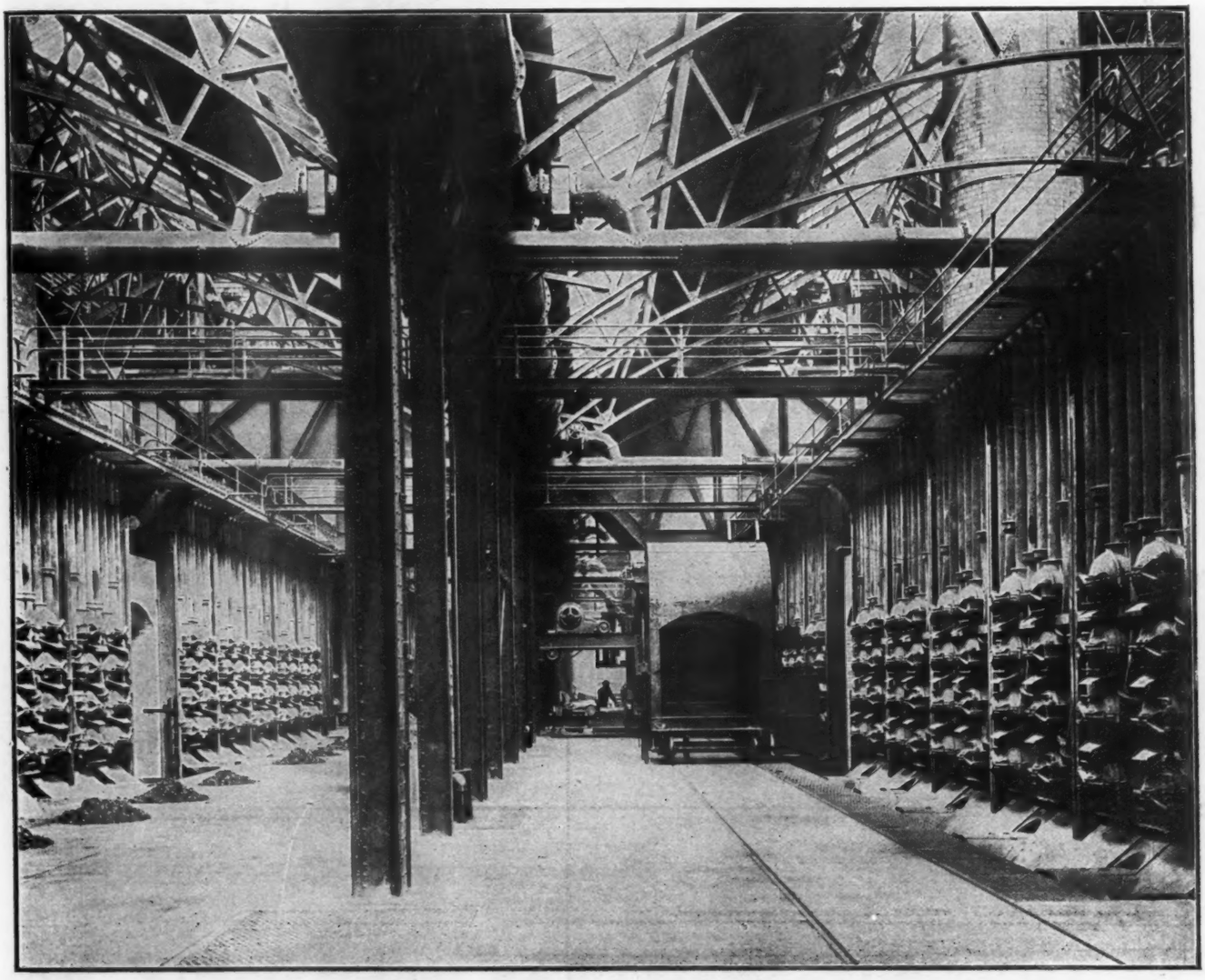

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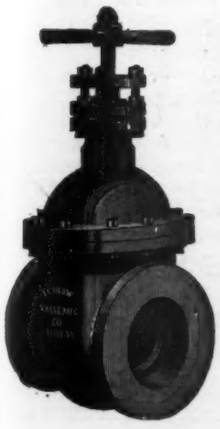

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Double and Single Gate Valves, ¼" to 72",

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Complete Works Erected.

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POSITIVE GAS EXHAUSTERS AND BLOWERS,

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Most Simple and Efficient Machine on the Market. Let us figure on YOUR requirements.

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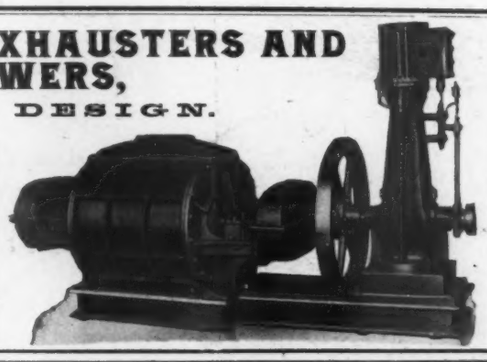

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An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland; being the 39th year of publication. Compiled and arranged by JOHN W. FIELD, Sec'y and Gen. Mgr. of The Gas Light and Coke Company, London. Price, $5. For Sale by A. M. CALLENDER & CO., 42 Pine St., New York City.

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Humphrey Instantaneous Bath Water Heaters

Should be used in every home. They make Hot Water **always** ready. Require no attention after installation. Hot water pours forth at any time upon lighting the gas. Close off the gas and all expense ceases. Absolutely Guaranteed.

Special Merits.

A burner that won't light back; a rust proof enameled shelf; a removable base plate for ready access to burner.

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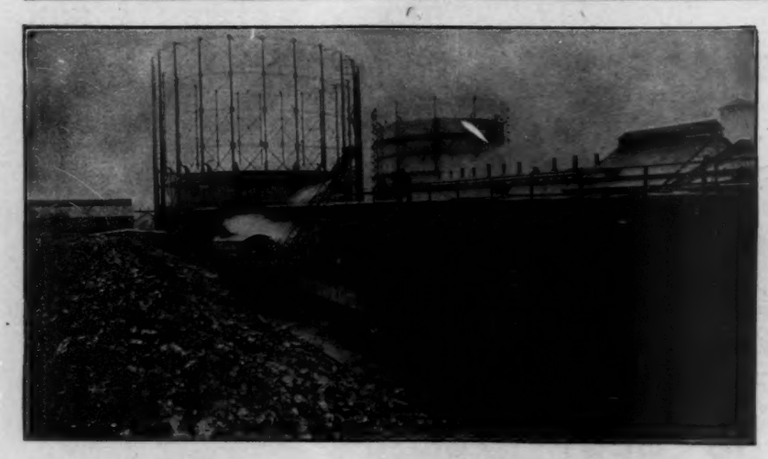

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THE BROWN HOISTING MACHINERY COMPANY,

Designers and Builders of All Kinds of Hoisting Machinery.

Main Office and Works:
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Mueller Service Clamps

Are made of malleable iron galvanized, and are carefully designed to support the weight of the pipe they are tapped for, being reinforced by an extra heavy rib on each side of the boss.

A molded Lead Ring Gasket fitting a groove in the under side of the clamp insures a perfect joint.

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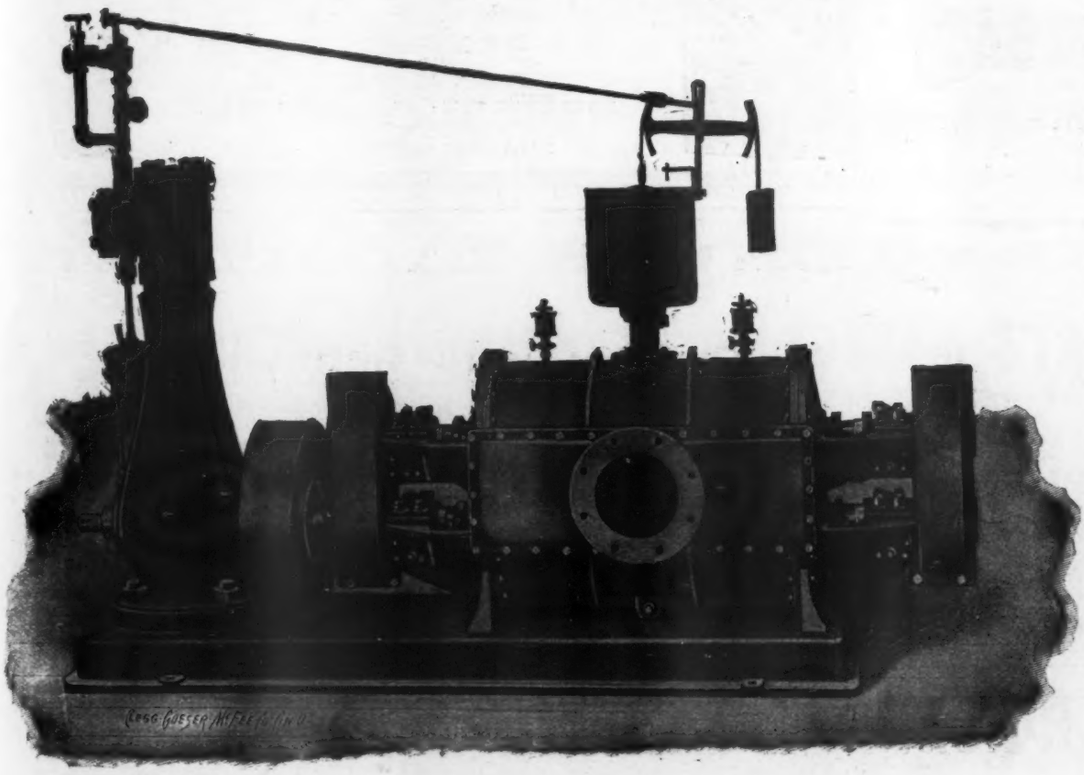

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Self-oiling, adjustable bronze bearings.

Most perfect and sensitive Governor.

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THE WM. H. BRISTOL ELECTRIC PYROMETERS
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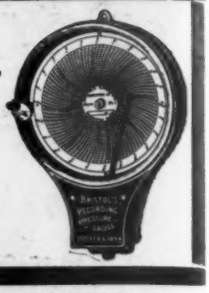

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New York. BRANCH OFFICES. Chicago.

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— USE —

Bray's Special Burner.

BRAY'S MARKET OR STANDARD BURNERS.

For Markets, Meat Shops, Fruit Stands, Show Windows, Street Lamps, and all places where high candle power is required.

These Burners Give a Large, Well-Shaped Flame.

They are Very Durable and Can be Depended Upon to Give Satisfactory Service for Years.

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Prices on Application.

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Bray's Standard Jumbo.

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Benches.—We erect GAS RETORT BENCHES with Horizontal retorts having closed ends, or Through retorts up to 20 feet in length.

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The "Gas World" Analyses of Accounts of Gas Undertakings,

For 1906-1907,

Showing at a glance the Accounts of 113 Coal and Water Gas Companies, Itemized under

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Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

SEPTEMBER, 1908.

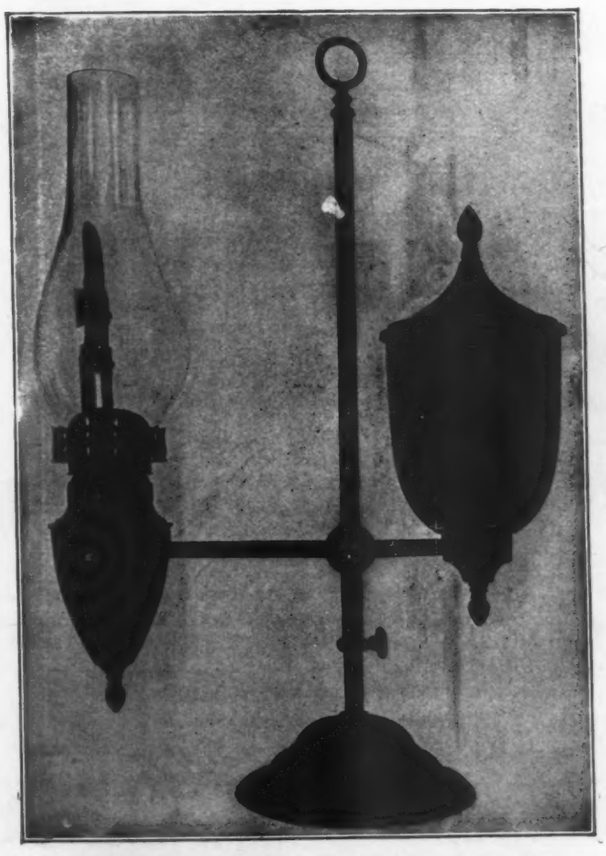
Table No. 1.
FOLLOWING THE MOON.

Day of Week.	Date.	Light.	Extinguish.
Tue.	1	8.30PM	4.30 AM
Wed.	2	9.10	4.30
Thu.	3	9.50FQ	4.30
Fri.	4	10.30	4.30
Sat.	5	11.30	4.30
Sun.	6	12.40AM	4.30
Mon.	7	1.50	4.30
Tue.	8	3.10	4.30
Wed.	9	No L.	No L.
Thu.	10	No L.FM	No L.
Fri.	11	No L.	No L.
Sat.	12	6.50PM	8.50PM
Sun.	13	6.40	9.30
Mon.	14	6.40	10.00
Tue.	15	6.40	10.30
Wed.	16	6.40LQ	11.10
Thu.	17	6.40	12.00
Fri.	18	6.40	12.50AM
Sat.	19	6.40	1.40
Sun.	20	6.30	2.40
Mon.	21	6.30	3.40
Tue.	22	6 30	4.50
Wed.	23	6.30	4.50
Thu.	24	6.30	4.50
Fri.	25	6.30NM	4.50
Sat.	26	6.30	4.50
Sun.	27	6.20	4.50
Mon.	28	6.20	4.50
Tue.	29	6.20	4.50
Wed.	30	7.50	4.50

TOTAL HOURS DURING 1908.

By Table No. 1.

	Hrs.Min.
January	228.30
February	187.30
March	192.00
April	160.10
May	155.10
June	138.00
July	155.50
August	173.40
September	185.20
October	214.00
November	218.10
December	226.40
Total, yr.	2235.00



THE ELLIOTT KEROSENE STANDARD PHOTOMETER LAMP.

✻✻✻

10-Candle Power.

✻✻✻

This lamp is a perfect substitute for the 10-candle Pentane Lamp hitherto used, and has the following advantages:

1st. It uses Standard Kerosene Oil (Pratt's Astral Oil or equivalent).

2d. It is remarkably steady. Will burn 24 hours continuously with less than 2 per cent. variation.

3d. It is much less dangerous than Pentane, which is a kind of gasolene.

4th. It is not easily affected by air currents in the photometer room.

5th. Since the lamp may burn continuously, the candle power of gas may be taken at any moment, if necessary. This insures steady illuminating power without waste of carburetting material.

6th. The first cost of the lamp brings it within the reach of even small gas works.

7th. Costs much less to maintain than a Pentane lamp or sperm candles doing the same service.

8th. Is not affected by the weather.

PUBLIC LIGHTING TABLE.

SEPTEMBER, 1908.

Table No. 2.
NEW YORK CITY.
ALL NIGHT LIGHTING.

Day of Week.	Date.	Complete Lighting in One Hour From Time Given P. M.	Complete Extinguishing in 50 Minutes From Time Given A. M.
Tue.	1	6.27	3.57
Wed.	2	6.27	3.57
Thu.	3	6.17	4.07
Fri.	4	6.17	4.07
Sat.	5	6.17	4.07
Sun.	6	6.17	4.07
Mon.	7	6.12	4.07
Tue.	8	6.12	4.07
Wed.	9	6.12	4.07
Thu.	10	6.02	4.17
Fri.	11	6.02	4.17
Sat.	12	6.02	4.17
Sun.	13	6.02	4.17
Mon.	14	6.02	4.17
Tue.	15	6.02	4.17
Wed.	16	6.02	4.17
Thu.	17	5.52	4.27
Fri.	18	5.52	4.27
Sat.	19	5.52	4.27
Sun.	20	5.52	4.27
Mon.	21	5.47	4.27
Tue.	22	5.47	4.27
Wed.	23	5.47	4.27
Thu.	24	5.37	4.37
Fri.	25	5.37	4.37
Sat.	26	5.37	4.37
Sun.	27	5.37	4.37
Mon.	28	5.32	4.37
Tue.	29	5.32	4.37
Wed.	30	5.32	4.37

TOTAL HOURS DURING 1908.

	Hrs.Min.
January	481.50
February	329 15
March	351.50
April	341.50
May	233.05
June	218.10
July	282.55
August	254.55
September	292.25
October	420.45
November	374.30
December	411.05
	3992.35
Deduct on account of 50 min. extinguishing time	30.30
Total, yr.	3962.05

NEW YORK, 318 West 42d Street. BOSTON, 820 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, 218 La Salle Street. SAN FRANCISCO, 512 Oak Street.

WELSBACH STREET LIGHTING COMPANY

....OF AMERICA....

No. 36.

Controls and Operates the **Welsbach System of Street Lighting,**

Which includes its specially DESIGNED and PATENTED BURNER for PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 130 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

The Chic Light.

ONE OF THE MOST POPULAR AND BEST SELLERS OF THE WELSBACH LINE.

For decorative appearance and large volume of light at a popular price to the consumer,

THE CHIC LIGHT

is practically alone in the field. Complete satisfaction to the user is its strong point.

THE CHIC LIGHT—Design No. 71310.

PRICES:

Boxed complete, with No. 71 Welsbach burner, No. 310 F. Q. M. cylinder, No. 196 Junior J Brand Welsbach mantle, including the No. 316 opal shade, which will be packed separately.

Price, complete, clear cylinder, each, dozen lots, ... $1.35
Price, complete, clear cylinder, 100 lots, each, ... 1.25

When supplied with **No. 310 F. Q. M. Opal Cylinder** add 10 cents to above list.

Price of Shade No. 316.
Package Contains 16 Dozen.

Price, per dozen, ... $4.40
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Salesrooms in all Leading Cities of the United States.

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Largest Builders of CARBURETTED WATER GAS PLANT IN AMERICA.

SOLE AMERICAN BUILDERS

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Jenkintown, Pa. (2d contract).
Coney Island, N. Y.
Mexico, Mo.
Jacksonville, Fla.
Syracuse, N. Y. (2d contract).
Atlanta, Ga. (2d contract).
Holyoke, Mass.
Peoria, Ills.
Schenectady, N. Y. (2d contract).
Danbury, Conn.
Galveston, Tex. (2d contract).
Quebec, Canada.
Indianapolis, Ind. (2d contract).
Bessemer, Ala.
Waterbury, Conn. (5th contract).
Sioux Falls, S. D. (3d contract).
Philadelphia, Pa.
New Hartford, Conn.
Poughkeepsie, N.Y. (2d contract).
Nashville, Tenn.
Salisbury, Md.
Norfolk, Va. (4th contract).
Wallingford, Conn.
Richmond, Va. (2d contract).
Oak Bluffs, Mass.
Arlington, Mass.

TOTAL SETS INSTALLED DURING YEAR, ... 43
TOTAL SETS INSTALLED TO DECEMBER 31, 1907, ... 677
TOTAL DAILY CAPACITY, TO DECEMBER 31, 1907, ... 545,865,000 cu. ft.

Tar Extractors for Carburetted Water Gas.
Photometrical Apparatus.
Gas Analysis Apparatus.
Recording Gauges.
Straight Standpipe System for Coal Gas Retorts.
Straight Standpipe Cleaners.
Waste Heat Boiler.
Hygrometer.
Venturi Meter for Measuring Flow of Air Blast.

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Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

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ELECTRIC GAS LIGHTING.

How to install electric gas igniting apparatus, including the jump spark and multiple systems for use in houses, churches, theaters, halls, schools, stores or any large building. Also, the care and selection of suitable batteries, wiring and repairs.

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Manufacturers of all Material for the Construction of Coal Gas Benches.

HALF AND FULL DEPTH AND FREE FIRING BENCHES,

All styles of which we have in operation, equipped with the BEST of LATEST IMPROVEMENTS, proving our claim for SUPERIOR QUALITY and EFFICIENCY.

INCLINES—We have in SUCCESSFUL OPERATION benches of Inclined Retorts, MANUFACTURED and ERECTED by us.

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Engineers and Builders of all styles of Standard and Special Benches from one to twelve Retorts, Horizontal, Vertical, or Inclined.

We will guarantee "Better Benches," to be easier to control, make more gas per retort, and operate with less fuel than any bench on the market.

ALL WORKMANSHIP AND MATERIAL GUARANTEED.

JOHN DELL,
President and General Manager.

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ESTABLISHED 1882.

MANUFACTURERS OF

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We are the **Exclusive Agents** *for the* **Mitchell Patent Benches,** *Constructed with Half or Full Depth Furnaces, to Burn either Coal or Coke, and Arranged for Front or* **Rear Clinkering.** **The Mitchell** *is the* **Original Coal Firing Bench.** *We also Erect Plain Benches with* **One to Six Retorts.**

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Three-Scoop and Three-Rake Charging and Discharging Machines are operating in New York, Newark, N. J., Philadelphia, Worcester, Mass., Mt. Vernon, N. Y., Toronto and Montreal, Canada, Detroit, Seattle, Rochester and St. Louis.

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Hot Coke Conveyor, Quencher and Steam Exhauster, operating in Toronto, Canada, working in water-sealed flue, rollers being protected from heat and grit.

COAL CRUSHERS, CONVEYORS AND BINS. TURNTABLES FOR MACHINES.

Labor-Saving Machines for Handling Coal and Coke from Coal Cars to Coke Yard or Bins. Coke Screening and Measuring Plants a Specialty.

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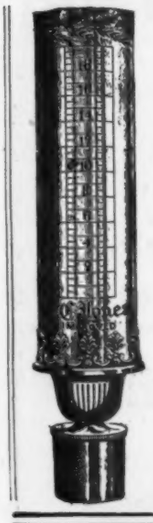

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Wide Experience in High Pressure Installation and Extension.

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12-inch High Pressure Governor.

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We make all sizes for all classes of reduction,

Double and Single District Stations,

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HOLDER GOVERNORS

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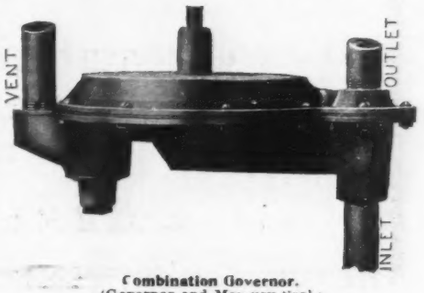

Combination Governor.
(Governor and Mercury Seal.)

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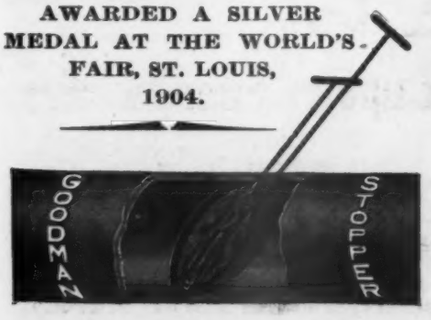

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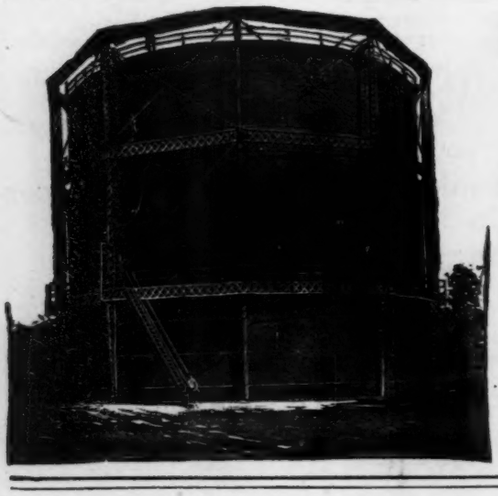

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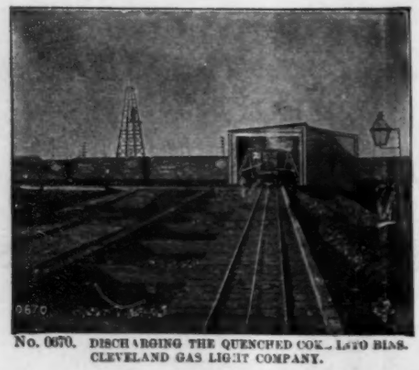

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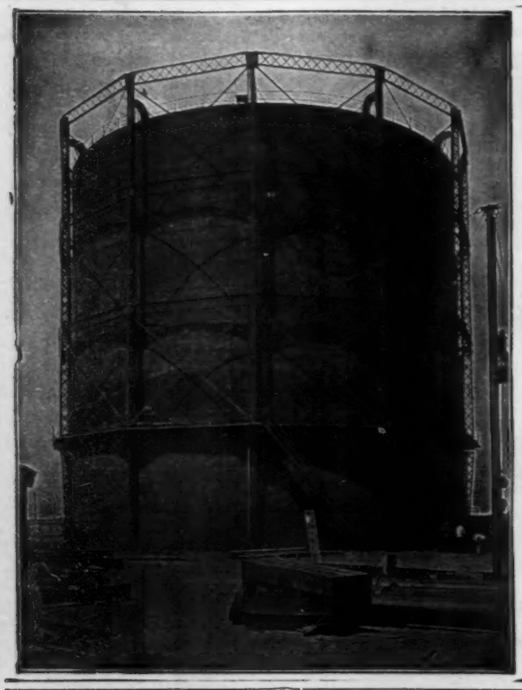

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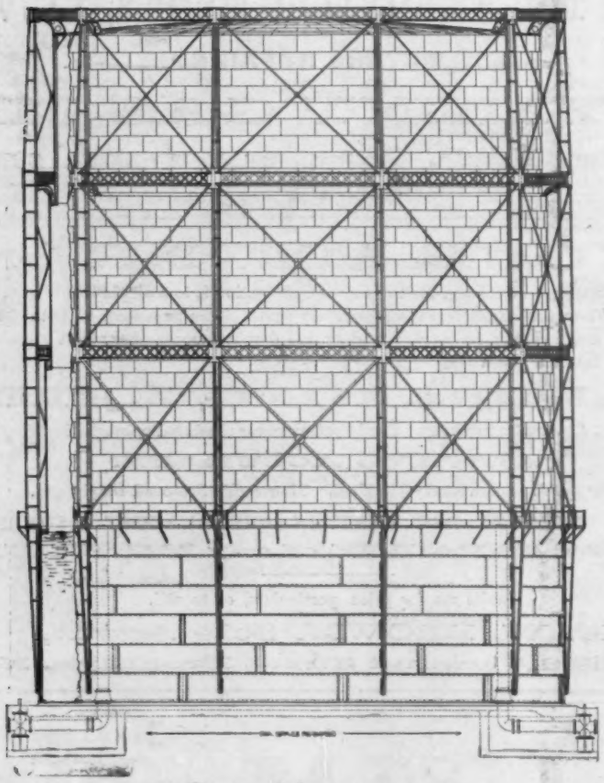

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